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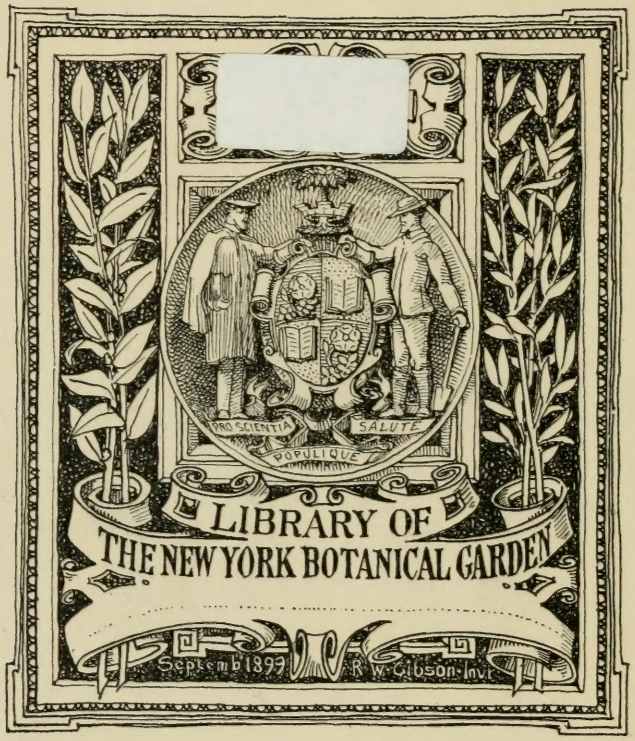
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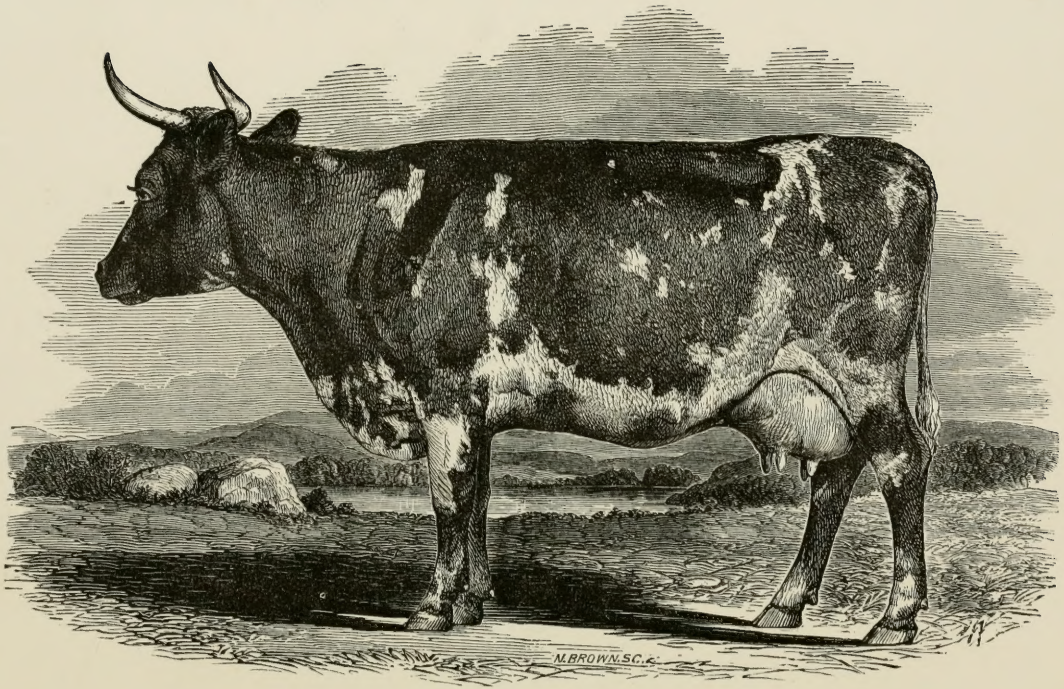

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See preface to Second Part.

TWENTY-THIRD ANNUAL REPORT

OF THE

SECRETARY

OF THE

Massachusetts Board of Agriculture:

WITH AN APPENDIX,

CONTAINING

REPORTS OF DELEGATES APPOINTED TO VISIT THE COUNTY EXHIBITIONS,

AND ALSO

RETURNS OF THE FINANCES OF THE AGRICULTURAL SOCIETIES,

FOR

1875.

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STATE BOARD OF AGRICULTURE—1876.

MEMBERS EX OFFICIIS.

His Excellency ALEXANDER H. RICE.
Hon. HENRY B. PEIRCE, *Secretary of the Commonwealth.*
WILLIAM S. CLARK, *President Mass. Agricultural College.*
CHARLES A. GOESSMANN, *State Agricultural Chemist.*

APPOINTED BY THE GOVERNOR AND COUNCIL.

	Term Expires.
MARSHALL P. WILDER, *of Boston*,	1877
LEVERETT SALTONSTALL, *of Newton*,	1878
PAUL A. CHADBOURNE, *of Williamstown*,	1879

CHOSEN BY THE COUNTY SOCIETIES.

Massachusetts,	CHARLES S. SARGENT, of Brookline,	1877
Essex,	GEORGE B. LORING, of Salem,	1878
Middlesex,	JOHN B. MOORE, of Concord,	1879
Middlesex North,	JONATHAN LADD, of Lowell,	1877
Middlesex South,	ELIJAH PERRY, of Natick,	1878
Worcester,	O. B. HADWEN, of Worcester,	1878
Worcester West,	ADDISON H. HOLLAND, of Barre,	1878
Worcester North,	STEPHEN SHEPLEY, of Fitchburg,	1878
Worcester North-West,	COURTLON SANDERSON, of Phillipston,	1877
Worcester South,	DANIEL DWIGHT, of Dudley,	1877
Worcester South-East,	WILLIAM KNOWLTON, of Upton,	1879
Hampshire, Franklin & Hampden,	MILO J. SMITH, of Northampton,	1879
Hampshire,	LEVI P. WARNER, of Sunderland,	1877
Highland,	METCALF J. SMITH, of Middlefield,	1878
Hampden,	J. N. BAGG, of West Springfield,	1879
Hampden East,	HORACE P. WAKEFIELD, of Monson,	1879
Union,	FRANKLIN C. KNOX, of Blandford,	1877
Franklin,	WHITNEY L. WARNER, of Sunderland,	1877
Deerfield Valley,	E. C. HAWKS, of Charlemont,	1878
Berkshire,	JOHN E. MERRILL, of Pittsfield,	1879
Hoosac Valley,	——— ———, of ———,	–
Housatonic,	DANIEL B. FENN, of Stockbridge,	1879
Norfolk,	ELIPHALET STONE, of Dedham,	1877
Hingham,	SOLOMON LINCOLN, of Hingham,	1879
Bristol,	EDMUND H. BENNETT, of Taunton,	1878
Bristol Central,	JOHN A. HAWES, of Fairhaven,	1879
Plymouth,	CHARLES G. DAVIS, of Plymouth,	1878
Marshfield,	GEORGE M. BAKER, of Marshfield,	1879
Barnstable,	S. B. PHINNEY, of Barnstable,	1877
Nantucket,	ALEXANDER MACY, Jr., of Nantucket,	1879
Martha's Vineyard,	HEBRON VINCENT, of Edgartown,	1877

CHARLES L. FLINT, *Secretary.*

TWENTY-THIRD ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE.

To the Senate and House of Representatives of the Commonwealth of Massachusetts.

The year has been prosperous and favorable for most branches of farming industry. While a continued depression has hung like a pall over mercantile, manufacturing, and mechanical pursuits, paralyzing trade and creating a general want of confidence, a spirit of courage and hopefulness may be said to have pervaded the agricultural community. The presence of heat and moisture, distributed with some degree of uniformity throughout the season of most active vegetation, furnishes the conditions favorable to a productive year on the farm. In this respect the season has been more than usually propitious, no drought of any severity having occurred to injure the crops or cut short the period of vegetable growth.

Among the enterprises of an agricultural character that are especially worthy of mention, is that of the diking-in and reclaiming extensive tracts of salt marshes along the seashore. Green Harbor Marsh, situated in the town of Marshfield, has been shut off from the tides of the ocean, at an expense exceeding thirty thousand dollars, and over fourteen hundred acres have thus been put into a condition to add materially to the productive wealth of the State. Extensive and careful scientific investigations have been instituted under

the direction of the State Board of Agriculture, to ascertain the changes which take place in the soils of reclaimed marshes, with the hope of rendering efficient aid to those who have undertaken this great public work. These investigations, though not yet completed, were partially developed in my last Annual Report, and a continuation of the able paper then presented will be found on a subsequent page of this Report.

The results of this enterprise are already apparent, in the increased interest in similar undertakings at various points upon our coast, and the time will undoubtedly come when many broad acres will be added to the productive area of the Commonwealth.

The operations of the Board have been continued as heretofore, and they will be fully presented in the following pages. The plan of holding public meetings every year in various parts of the State, has commended itself to popular favor, and the meetings have been largely attended by intelligent and appreciative audiences. The country meeting, this year, was held in the city of Haverhill.

PUBLIC MEETING OF THE BOARD,

At HAVERHILL.

The usual country meeting of the Board was held at Tilton's Hall, in Haverhill, on the 30th of November and the first and second days of December. The meeting was called to order on Tuesday, November 30, by Hon. George B. Loring.

OPENING REMARKS OF DR. LORING.

Gentlemen of the State Board of Agriculture:—As the delegate from the Essex County Agricultural Society to the Massachusetts Board of Agriculture, it becomes my duty to call this meeting to order, having been selected as chairman of the committee on organization, on account of my official position in this section of the State. This is the twelfth meeting which the Board has held for the purpose of comparing notes, and of discussing the practical questions which come naturally and always before the agricultural meetings

that are held in various parts of the country. It was an experiment on the part of the Board at the time the institution was organized, and I remember, too, that it was an experiment which, in the minds of many of the Board, did not promise much. But the success which has attended these meetings has encouraged us to continue them, until at last they have become a part of the agricultural educational system of the Commonwealth.

It is manifest that the Board of Agriculture of this State, founded now more than twenty years ago, has become at last, as it were, a Farmer's College, and the members of the Board, representing as they do the practical farmers of the State, bring together in these meetings the results of the practical operations of the farmers in this State. They represent the practical agriculture of the Commonwealth exactly as the Agricultural College represents the endeavors to develop the scientific culture here for the benefit of the farmer. The Board is the natural outgrowth of the agricultural societies of the Commonwealth. These institutions, founded early in the history of agricultural investigations, have become at last the Agricultural Institutes in our land. They were guided and controlled and perfected by the ablest men among us. In this State and in other States, the learned men and statesmen gathered about these associations for the purpose of controlling and developing what to them was the great fundamental interest of the country. It was an occupation which attracted the attention of the founders of the Republic; and among the most earnest advocates of agricultural societies were Washington—"the father of his country," the first president,—and Jefferson, the author of the Declaration of Independence. Here in Essex County, the leading and powerful men took their stand in this direction. The founder of the Essex Agricultural Society, Timothy Pickering, was among the ablest men of his time, and after he had performed great service in the field, as a colonel in the Revolutionary War, in the cabinet, as secretary of state and of war, and as senator from Massachusetts, he felt proud to retire to his farm and establish the Essex Agricultural Society as the best mode in which he could impart his information to the people, and the best mode in which they could learn those processes by

which they could pursue agriculture profitably and well. The agricultural societies of the State, thus founded, spread everywhere, not only in New England, but in New York, Pennsylvania and other States. They became the allies of similar institutions abroad,—of the Royal Agricultural Society of England, whose business it was, in its early days, to introduce the great scientists of that time into the business of developing agricultural information, and of ameliorating agricultural labor. It was a custom which at last was followed everywhere; and as the Board of Agriculture abroad brought out Sir Humphry Davy, and introduced him, with his scientific investigations, into the practical business of cultivating the soil of England, and introduced other scientists for the purpose of developing the great crops there, and ascertaining the best modes of breeding and feeding cattle, so exactly have the agricultural societies of this country grown and developed at last into organizations like this, representing not only the toil upon the land, but the honest and earnest endeavors of the farmers at their own firesides to study the laws by which they can be best guided in their business. The Board of Agriculture of Massachusetts to-day presents the attitude which I have stated to you,—that of endeavoring in every way to rouse the agricultural mind of the Commonwealth and guide the farmer in his calling. It is, therefore, the Farmer's College, in which all men are professors and teachers, and all men are learners.

Now, it becomes my duty to welcome an association like this, on this occasion, to Essex County, which has done much for the development of agriculture in time past, and which, to a certain extent, has set the law of farming, which I consider will ultimately be the general law established and accepted throughout this entire country. The town in which we are assembled has long been distinguished for the care and system with which the land has been cultivated and the business of manufacturing has been conducted. Settled, as it was, two hundred and thirty-five years ago, in precisely the same manner in which so many New England towns were settled, by an honest, faithful, and earnest clergyman leading his little flock into the wilderness for the purpose of enjoying what our fathers demanded and insisted on here, "freedom to

worship God," it became at last one of those towns in the county which were distinguished for the skill and prosperity of the agricultural community which was settled here. It was finely located on the banks of this swift-running river, which came flashing along from the mountains of New Hampshire and the lakes above, with no alluvial soil, but with those rich and fertile and heavy clay banks which are so superior, under the long-continued toil of the farmer, for the purposes of various crops. Here the fathers established a prosperous agricultural community, and year after year, for more than two centuries, Haverhill performed her part as one of the leading towns in this Commonwealth. When the business of agriculture began to decline, and the attention of our people was turned to other branches of business, how she sprang forth to accept the work which was then laid before us, advancing in a few years from a little town of 3,500 people, prosperous in their agricultural pursuits, to a city of almost 15,000 people, with more than 150 firms engaged in the manufacture of leather and its products, and with an annual production of ten millions of dollars from her industry alone! It is in a town like this that we have gathered to-day, one of the significant towns of the State of Massachusetts; one of those towns which, having grown out of the simple and primitive agriculture of our fathers, has developed, by its industry and skill, not only the agriculture of the section in which it is located, but its own inherent power and wealth, and has fixed here the great law of American farming, which is, that local markets shall be the sources of profit to the farmer.

Now, in welcoming you to this spot, I congratulate you that you have fallen upon so hospitable a community, and I am sure you will agree with me before this meeting closes, that you have also fallen into an attentive and intelligent assembly.

The agriculture of this county—which is now a matter of interest to us, having assembled here—has passed through all the various phases of agricultural necessity and experience in this country. The coast line here was early inhabited. Salem was settled two years before Boston, and from that day down to the early part of this century, agriculture was the main

business of the people; and under the influence of such minds as I have alluded to, and, more than that, under the stimulating influence of agricultural prosperity here, the primitive farming of Essex County became one of the most advanced and prosperous branches of agriculture in the whole Commonwealth. The soil here was filled with virgin fertility; it was not necessary, then, to resort to those artificial modes of agriculture which are now so necessary in order to grow a crop. The whole business was simple, and the great crops were brought forth here almost spontaneously by a bountiful nature. I remember one of the records kept in this county, less than a century ago, in which it was stated that under the ordinary cultivation of the soil, 750 bushels of potatoes had been raised upon one acre of land, and 650 bushels of carrots, 850 bushels of ruta-bagas (Swedish turnips) and 1,050 bushels of mangold-wurzels; and upon ten acres of land, for thirty years, there had been produced an average of three tons of hay to the acre,—land that had not been broken by the plough in all that time, but had received at the hand of the cultivator a fair and proper top-dressing from year to year. That was the agriculture of those times. It was simple, economical, primitive, prosperous, profitable; and the market of those farmers was of such a description throughout this county and the neighboring counties of Suffolk and Middlesex, that prosperity attended the agriculture of this part of the State with more constancy and reliability than prosperity now attends any more active and vigorous branch of business or any commercial occupation now known in this Commonwealth. It was primitive, as I say, because there was no necessity for the application of that skill and care which we now depend upon. Why, gentlemen, you know well, that the condition of pasture-lands here in the early days was such that any man who fed his cattle upon those pastures could absolutely defy all the laws of breeding and all those physiological laws which are now considered so important to the cattle-breeder. It was in this county, for instance, that the famous Oakes cow, known in the early annals of agriculture, reached her distinction. The Oakes cow, the queen of all cows in those early days, was fed and made her record within the limits of this county. She made a great record

for herself, it is true. It is told of her that she gave seventeen quarts of milk a day, and made fifteen pounds of butter in a week, and that she continued to discharge her service in this fashion month after month, beginning early in the spring and going on until early in the following winter. She was considered a remarkable cow, and her record was kept because she was remarkable. It seems she was an animal that could be easily and profitably fed upon those primitive pastures, under the uneconomical methods which prevailed in the early time. But you who are now compelled to select with the utmost care your animals for the production of beef, and must learn what can be fed most profitably upon your pastures and in your barns for that purpose, and who are ready to avail yourselves continually of the skill of the English breeder, who has produced for you the Shorthorn; you who have learned that it is no accident that will enable a man to feed an animal for beef profitably now, but that it must be done in accordance with the most accurate rules most skilfully applied,—you will learn with astonishment what the structure of this cow was, which in those early days was considered so profitable. And you who are compelled, in your production of milk for the milk market here and in every other city in the Commonwealth, to select animals which can be fed most profitably for that purpose, and know perfectly well that a cow will produce her milk profitably or unprofitably according to her physiological and anatomical structure, and that you must select with care a heavy, well-made, easy-feeding, milk-producing animal if you want a cow that will be profitable for dairy purposes,—you, too, will be astonished when you learn of the structure of this remarkable cow. She had no quality which a breeder of these days would value. Her countenance was gloomy, dull and sour. Her head was ill-shaped. She had none of those fine lines which, to the English or to the American breeder, would signify thrift, easy feeding and a rapid production of either beef or milk. Her neck was ill-shaped; it was not properly put upon her body; and her shoulders were so rough that they seemed to stand above her chine, so that you would imagine they must have been two inches higher than her backbone. Her back was rough, uneven and irregular; her hind-

quarters and shoulders very small and light, just sufficient to carry her about; and her carcass was a vehicle of enormous capacity, capable of taking in a vast amount of food and drink for the production of milk and butter, but of consuming more food and more water, even, than any farmer can afford to supply in these days, when we depend on hay at twenty-five dollars a ton, and for water are at the mercy of the water-board of a city. That was her structure. What the feel of this animal was I will not undertake to say, because I never put my hand upon her; but, judging from her general construction and outline, I should say that her feel was hard; that her hair was wiry; and that her general condition was such that, in these days of accurate and economical agriculture, a strict and accurate judge would have said, "I cannot possibly feed such an animal on my short pastures and in my expensive barns." It was only in those primitive days that animals like the Oakes cow could be fed with any profit.

That was the way our fathers carried on their business. They had very simple appliances. The shovels of the old times, with which they did their work, would be rejected in an instant in these days, and their farm implements of every description were rude, rough and irregular. In only one single implement known here, were the farmers of Essex County, in the early days, supplied in such a way that they could win triumphs in any agricultural field; and that was the plough. In this connection it may be curious and interesting to you to know that there is to-day in this county the triumphant plough of the olden time,—the wooden mould-board plough which won all the early prizes at the Essex fairs. That old wooden mould-board plough, shod with iron, with an upright share, which has ploughed its way satisfactorily season after season here, and now reposes in the elegant and well-ordered tool-room of the recent president of the Essex County Society, General Sutton, is a sample of what the skill of the Essex County farmer, in the olden time, did for that simple implement of husbandry. That plough was curious in its construction, and I desire to call your attention to it, in order that you may say to every plough-maker in this land that this plough has certain principles in it that may be followed everywhere. This plough, which was a favorite

here, and which in the early days stood out as superior to all agricultural implements of its kind, is constructed, in the first place, with a very long and very solid land-side. I think it would run alone anywhere, and it has been said of it that it has often been set into the furrow and left to pursue its course alone, the team drawing it over the field. It would stand like a sled-shoe; and if you were to look at it to-day, it would remind you of the old-fashioned wooden sled, such as our fathers used in hauling their wood to their door-yards. I have always insisted upon it that a land-side is of the first importance in a plough; that a plough without a land-side is like a sled without a sled-shoe,—it can only be held in place by main strength. A strong man may hold it, but a feeble man can no more handle it than a child ten years old can steer a clipper-ship round Cape Horn. A plough without any sort of balance between the mould-board and the land-side is far from perfect. That plough of which I am speaking, has laid down this one law,—that a good land-side to a plough is a good thing; and I commend it to the inventors of ploughs in this State and elsewhere as a law which they had better adopt.

In all the implements of farming, with the exception of this one plough, our ancestors were in that rude and primitive condition. Their business was a simple one. They had fertile lands, they had rich pastures, they had rude implements of husbandry; but they had strong arms, had good markets, economical modes of life; they got a good living, and they constituted, in the early times, a sturdy, substantial, honorable and honest class in the Commonwealth, who laid the foundation of those virtues which, I am happy to say, have given to Essex County her power in time past in this Commonwealth.

I have gone over the condition of affairs in this county, which in the early day stood at the head of farming in this Commonwealth, not only in her practical business, but in the intellectual endeavors made here. We have gone on from that condition, but advancing still. The agriculture of the county has indeed changed, and it may be interesting to some of you to know how. My attention was attracted, two or three years ago, to the repeated attacks which were made upon the prosperity of Massachusetts farming. I was told that the agricultural towns were decaying, that town after

town was dying out, farm after farm being deserted, and that the agricultural products of the Commonwealth were being reduced in quantity and value year after year. It occurred to me that as Essex County had been in the olden time a representative county in agricultural matters, perhaps it might be a representative county still, and I would examine its statistics and see if I could not learn the lesson which has been taught here, year after year, perhaps to encourage me in my belief, which somehow I insisted upon maintaining, that Massachusetts farming was not on the decline; that it was changing its relations, changing its processes, but advancing still. I found that in this county, since the days which I have been describing, there had grown up large manufacturing centres; that Lawrence had sprung out of nothing, within twenty-five years, into a town of more than 30,000 people, with mills, shops, congregations of people, the aggregation of a busy population; that Lynn had increased from 3,000 to 30,000; that Gloucester had grown in proportion; that Haverhill had sprung up from 3,500 to 15,000 people; that Salem had increased from 15,000 to 25,000; that everywhere there were growing towns such as these, which were constantly drawing away people from the land, but at the same time furnishing good markets for all those who chose to remain there. And I ascertained, moreover, that while the cattle of this county were decreasing, the cows were diminishing in number, and the oxen, year after year, were growing less and less, until at last it seemed as if the existence of a good ox-team here had become an impossibility; while the grain-crop was being reduced from 125,000 bushels down to 50,000 annually; while the hay-crop, even, was being diminished, and the products of the dairy—butter and cheese—were running down year after year,—I found that in one thing the farmers of Essex County had learned their lesson, and the figures told me, that in five years they increased their products of market-garden crops from $150,000 to more than $400,000; and I said to myself, while Essex County is increasing in her manufactures, and new cities are growing up here; while her commercial sections are improving, her farmers have by no means forgotten their business; and so I accounted to myself for this admirable view which was constantly before me, that

everywhere the farmhouses looked well, were well painted, that the farm barns were kept in good condition, the cattle well fed, that the farmers themselves, going to market with their crops, always looked solid and substantial, and had a good pair of horses with which to do their work. That I found was the condition of affairs; and so I learned that the Essex County farmer had found out for himself how to cultivate the soil; had passed away from that primitive mode to which I alluded in the beginning, and accepting the situation, had turned market-gardener, to occupy the local markets which were constantly growing up here.

Now, not only has Essex County done this for herself, but she has indicated, gentlemen, the law of American farming. You may look with envy upon the Western farmers who are filling the markets with their grain-crops, with their cattle and their hogs,—who supply the provisions that are used in the Eastern States, and all the exports of grain and provisions that are sent abroad,—you may look with envy upon them, and you may say that the man in the Western States, with a thousand or twelve hundred acres of land, engaged in this wholesale business of producing a supply of articles for the market, has really discovered the secret of prosperous farming. But not so. He is continually subject to the great commercial changes that are going on around him. He is at the mercy of foreign competitors. When he sends his wheat abroad he meets the wheat of the Black Sea, raised by men who receive no reward for their toil, who have no civil obligations, who have no expenses, who have no rights, have no status either in the state or in society. They meet grain raised by labor that costs next to nothing, and they, as citizens of the United States, with all their obligations, their duties, their desires, their ambitions, are compelled to compete with them. If they send their wool to market from Ohio, they meet Australian wool, grown almost spontaneously; they meet wool from the Cape of Good Hope, raised by men who can hardly be distinguished from the sheep on whose backs the wool is grown; they meet wool raised in California, where sheep are never housed. And so the great wool-producers of the West are continually staggered and tormented by the production of foreign wool with which they are to

compete. If they send their beef to market, if they pack it and ship it to Europe, before the fine Shorthorn steers of Illinois find their way into the market they are offset by the coarse, long-horned cattle from Hungary, perhaps, or Brazil, or Texas. These are the trials to which they are compelled to submit in their business; but when the law of American society becomes fixed here, and the centres of trade are established throughout the West and the South, as they are throughout the East, then the American farmer will learn exactly that lesson which the Essex County farmer has learned,—that it is the growth of products for the local markets which constitutes the prosperity of American farming. Then our farmers everywhere will sit down in that uniform and steady prosperity which marks all those men who know how to cultivate the soil lying around the great centres of trade. There are no men more prosperous than they, when they conduct their business as it should be conducted. It cannot be done in a careless, haphazard way, I grant. You cannot plant pear-trees where you ought to raise potatoes, perhaps. You cannot raise corn where you may raise mangold-wurzels. You must discriminate, and accept the law that the supply of local markets is the first thing, and then ascertain what crop is best adapted to the soil on which you live. Then farming becomes not only filled with the triumphant prosperity which marked it in the beginning, but it becomes part of the business of an intelligent, careful, ambitious, spirited and self-reliant people, who are unwilling to take their stand longer by the side of the semi-barbarians of a ruder farming on the frontier, but are determined to stand by the side of those who, by care and sleepless diligence, have organized our manufactures and commerce for the prosperity of the country. That, I conceive, to be American farming; that, I know, is the farming of Essex County; and there is not a farmer in this room who does not know that all I say of his calling here is true; that all I say of his opportunity is continually before his eyes. I believe the farmers around Haverhill know it. I know the farmers around Salem do. But if you will point me to a more prosperous body of men than those who in these localities devote themselves to the soil, I am perfectly willing to surrender my argument to you, but not till then.

Now, gentlemen, I have introduced to you Essex County, as I think, fairly. I welcome you within her borders, and trust and believe, and doubt not, that when you separate, you will leave behind some new law, some new fact, or some new statement, which the Essex County farmers, seizing, will use and pass on to still greater prosperity.

The meeting then adjourned to two o'clock in the afternoon.

Afternoon Session.

The meeting was called to order at two o'clock by Dr. Loring, who introduced, as the first speaker, Professor Stockbridge of the Agricultural College.

EXPERIMENTS IN FEEDING PLANTS.

BY HON. LEVI STOCKBRIDGE.

Mr. Chairman and Gentlemen of the Board of Agriculture,—Farmers of Massachusetts:—It will be recollected by the gentlemen of the Board that, at your last public or country meeting, which was held in Westfield, I had the honor of speaking to you upon the subject of feeding plants, and of giving some account of a series of experiments which had been tried at the Agricultural College in this direction. Speaking upon the same subject to-day, little remains for me to say, except to continue the narrative of those experiments at the College, giving the results of 1875, and drawing therefrom some rules for practice.

This subject of plant-nutrition is one which has attracted the attention of the scientific men both of Europe and America, has led to investigation and to experiment, and, as a matter of pure scientific investigation, is one of the very highest interest. But to the practical man, to the farmer, to him whose business it is to make plants as a means of livelihood, to him whose success or failure depends upon understanding the principles of plant-nutrition and upon being able successfully to apply them, the question is one of more than

ordinary interest; it is vital; a proper understanding or a misunderstanding of the principles, making all the difference between success and failure in his life-work. We must admit that the investigation of this subject of plant-nutrition, by scientific men, is one of modern date. In fact, it is true that for more than forty years scientific belief on this subject has been in a sort of transition state. Many of the theories which have been openly advocated have been found, by discovery and experiment, to have been without foundation. Scientific men have vacillated for forty years in relation to this matter of the principle of plant-nutrition.

At one time it was believed and openly advocated that plants depend for their nutrition upon the organic matter, or humus, in the soil. The humus theory had its day; and yet, when the touch of chemistry was put to it, it was found that certain soils were extremely fertile with only two or three per cent. of humus in their composition, and certain other soils were sterile with twenty, thirty or forty per cent. of humus in their composition. Then the humus theory went to the wall. Afterwards it was advocated, and even by the great Liebig, that, for their nutrition, plants needed only the application of the mineral elements; but he was met by the nitrogen theory men, and the contest went on, year after year, between the advocates of nitrogen and the advocates of minerals, until at length it was discovered that in some of their assumptions both the nitrogen men and the mineral men were wrong, and in some of their assumptions both the nitrogen men and the mineral men were right.

Then, in due course of time, came the theory, that in order to ascertain the wants of plants, that we might provide them with proper nutrition, it was simply necessary to analyze the soil, determine its wants and the structure or the composition of plants, and then the farmer might apply to his soil the elements in which it was deficient, and the plant would have an abundant supply of nutriment. But it was soon found that the acids of the chemist could wring from a sample of soil in the laboratory certain elements, which were supposed to be elements of nutrition, which the plant never could find in the soil; and that although the acid of the chemist might determine positively that there was an abun-

dance of phosphoric acid, for instance, in the soil, yet the plant might starve for want of phosphoric acid, because it was utterly unavailable. And thus for forty years have scientific men been moving backward and forward in relation to the principles of plant-nutrition,—experimenting, investigating, discovering gradually fact after fact,—until to-day it can probably be said with truth that there is almost universal harmony and unanimity of opinion among scientists in relation to the subject of plant-nutrition, and that that opinion has been sustained and upheld by the natural fact and law of the case.

It may not, therefore, be out of place if I speak for a moment of this belief of scientists in relation to plant-nutrition. In the first place, it is agreed,—and, gentlemen, I wish you would mark the language I use,—it is agreed among scientists that, *so far as the plant is concerned*, there is no difference in the importance and value of either of the two great classes of matter,—organic and inorganic. No plant can grow and make a perfect growth unless it has a supply, in such proportions as it needs, of both elements of matter,—organic and inorganic. That is, if the plant has access to all the mineral elements of nutrition it needs, those mineral elements of nutrition are utterly valueless in the production of the plant unless in some way the plant can obtain at the same time all it requires of the inorganic elements of nutrition. Again, that so far as the organic elements themselves are concerned, neither one of these elements, so far as the plant is concerned, is of more importance than any other. For instance: carbon is just as important to the plant as nitrogen; nitrogen is just as important to the plant as carbon. Nitrogen, however abundant in form calculated to give the plant nourishment, is worthless to the plant unless the plant can in some manner obtain the needed carbon. And so with the other two elements of organic nutrition. So, too, with the mineral elements of plant-food. Lime being abundant in the soil, is of no account to the plant unless at the same time it can get its required quantity of soda, of iron, of potash, or any other of the inorganic elements of nutrition. All, *so far as the plant is concerned*, are of equal importance. Another belief is, that the maximum quantity of crop to be

produced on any land is measured by the minimum quantity of the elements of nutrition contained within the soil. That is, that if in the soil there is a very small per cent., for instance, of lime, the quantity of crop which that land can produce will be measured by that minimum quantity, or the quantity of lime in the soil; and so with all the other elements of nutrition.

The next point of agreement in belief is in relation to the condition in which all the elements of nutrition must exist in the soil, and the manner in which the plant obtains that nutrition. It is the universal belief of scientific men who have examined this subject, that mere quantity is of no account; that coarse, crude, enormous bulk is of no account; but that the right proportion of the elements in a solvent condition is the standard of the amount of crop production in any given soil; not bulk, not mass, not enormous quantity, but certain elements of plant-nutrition in a solvent form, and in no other form. These alone can nourish plants.

Then they are agreed in relation to the manner in which plants obtain their food. And first in relation to the manner in which plants obtain their organic food,—the four elements, carbon, oxygen, hydrogen and nitrogen,—all absolutely essential to the plant. Take carbon first, if you please. Carbon in the plant is never obtained in the form of carbon, but in the form of a compound of carbon and oxygen—carbonic acid. In this form and this alone: carbonic acid taken from the air, or washed from soil-water in precipitation,—carbonic acid in the soil either formed by the action of oxygen on the carbonaceous material of the soil, absorbed by the water, and thrown by the vital force to the leaves, or carbonic acid taken from the air by absorption in the leaves, there to be decomposed, the carbon retained, united with the elements of water, passing now down the plant and going through the chemical changes in its passage to the tissues and to the inner bark of the plant, thrown out in different parts of the plant, from the inner tissues of the bark, forming the vegetable oils, the acids, the gum, the starch, the sugar, and the woody fibre of the plant-cellulose—the cellular tissue. This is the way in which the plant obtains its carbon; in this way, and by these organs of the plant. The nitrogen and the hydrogen of the

plant; that is, these elements of nutrition obtained from the elements of water which the roots are constantly throwing to the leaves, and from some of the retained oxygen in the decomposition of the carbonic acid.

Now, we come to the nitrogen, and, perhaps, in the whole round of the elements of plant-nutrition, here is the only one where there may be a diversity of opinion. Nitrogen in the form of ammonia, nitrogen in the form of nitric acid, is washed down to the soil by water, the nitrates formed in the soil and carried in the water to the roots of the plants, and, perhaps,—nay more, *probably*, from the elemental nitrogen of the air absorbed by the leaves,—perhaps in the form of carbonate of ammonia or the elemental nitrogen; and thus the plant is supplied with its element of plant-food,—nitrogen.

If we turn now to the mineral elements of plant-nutrition, these are obtained from the soil. Not the crude, coarse material of the soil itself. The plant does not live on soil, as soil, but the potash, the lime, the magnesia, the soda, the phosphoric acid, where acted on by certain natural agencies and reduced to a soluble condition, are taken in soil-water and carried by this root-action to the plant, and there distributed, almost—as far as physiological examination goes—as a foreign, useless and not needed material; yet, as we know, absolutely essential for the production of the plant.

Thus, gentlemen, we agree in relation to what plant-nutrition is, and we agree in relation to the manner in which the plant obtains its food.

Turning now to the other side,—to the practical men, to the farmers who till the soil and grow the crops,—we find that during all these forty years or more, there has been no advance in opinion or in belief, and no change among practical men in relation to the subject of feeding plants, or plant-nutrition. I mean the average farmer measures everything by barn-yard manure as the type. He estimates everything by the pile, by the bulk, by the quantity, by the cord, by the load, or by the ton; and to him it is utterly preposterous, it is enigmatical, it is beyond all belief, when you tell him that two or three hundred pounds of certain elements, placed within reach of the plant, will produce a larger crop than many tons of raw, crude, unchanged, undecomposed material, whether

you call it muck, or peat, or barn-yard manure, or compost. I say he measures everything by the quantity, the pile, the cord, or the load, and to him it is incomprehensible, it is humbug, to say that smaller quantities, in a different and in a better condition, can produce equal quantities of crops as a large mass of crude, unformed, unfitted material; and yet the same farmer complains, and is in a constant storm, because his business is a business above all other industries surrounded by doubt, and uncertain in relation to results. He will tell you that, obeying the injunction of Scripture, he "sows by all waters," but he cannot tell whether his crops will prosper, or whether they will prove all alike good; that the results are uncertain; that he knows not what his income may be; that he has done his duty; and he implies, although he does not say it, that he leaves the result with God. But, he says, after all, it depends entirely on the weather whether he shall have a crop or whether he shall not. No man can tell, he says, when he manures his land, when he ploughs it, and when he prepares it for the seed, whether he is to have a crop or not. It depends upon the weather; one season gives him abundant crops, another season gives a deficiency of crops. And when he says this, he does not allude, nor do I, to those exceptional seasons when we have a frost in July, or when we have those severe droughts, when the earth itself is fairly burned up, or when we have frosts which destroy all our crops in an immature condition. He simply refers to those variations of the seasons which do not allow the growth and perfection of maximum crops on the farm.

Now, right here, I want to ask and answer this question, as applicable to this subject of feeding plants, or of plant-nutrition: What have the ordinary variations of our seasons to do with the nutrition of plants, or with the development of plant-food in the soil? The farmer says he has done his duty when he has given the land a certain quantity of coarse, crude, raw material in mass; but what have the seasons to do with the development of plant-nutrition? Much, every way. In the first place, the chemical condition of the air remains about the same year after year, generation after generation. There are slight variations between the air of the town or the city and the open country; but, on the whole, the air always

contains about the same per cent. of oxygen, nitrogen, carbonic acid, nitric acid, ozone and ammonia. These are what we call atmospheric manures, or atmospheric elements of nutrition. Now, then, the influence of the seasons upon plant-nutrition must be this: its variable temperature, the amount of water which falls, and the amount of sunshine which acts upon the plant and upon the soil. Those are the three conditions of the seasons which vary the amount of plant-food that will be developed out of the soil itself or out of the material which the farmer has given to the soil artificially. Thus, if we have a wet season, an extra quantity of water-fall, which fills the interspaces of the soil so that the air is excluded, so that warmth is excluded, the soil does not become heated. Then the coarse, raw, undecomposed, unfermented mass of barn-yard manure, compost, muck, straw, clover, or grain-crops ploughed in, remain dormant and dead, and no nutriment is formed, and your plant starves for want of food. If, on the other hand, your season is one of excessive drought, little rain-fall, and the soil becomes dry, so that decomposition stops, then your raw, crude material, your barn-yard manure, and your muck, remain unchanged; no food is formed, and your plant starves for want of nutrition. Now, then, the seasons have to do with the plant-nutrition in just this way, and the farmer should have known that if he would feed his plants, and do it thoroughly, with the variations of the seasons, he could not afford to trust them to make plant-food out of raw or crude materials, but that it was a part of his duty to prepare the food for his plants ere he committed it to the soil, and then the action of the season of which he complains would have been entirely obviated, and he could have produced crops yearly without regard to these variations of the seasons which make maximum or minimum crops.

Now, gentlemen, having said this much, I am prepared to say that it was to prove just this thing, among other subjects connected and related to it, that a certain series of experiments was entered upon at the Agricultural College some six or seven years ago; to prove that one thing,—whether certain elements of plant-food, prepared in the condition of plant-food ready to nourish the plant, would not nourish

and produce plants almost in any quantity desired, without regard to the ordinary variations of the seasons. This was one of the subjects to be investigated, among others of kindred nature. This brings me properly to the subject of my address to-day,—experiments in feeding plants.

I see a few faces here that I did not see a year ago in Westfield, and that you may understand the work that has been performed in the College, it is necessary that I should, in as few words as possible, say something of these experiments prior to the year 1875. These experiments began in 1869. The first point to be ascertained was, whether certain elements of plant-nutrition—prepared in a certain way and given to the plants—would produce plants. Those experiments were tried four years, and it was found by using the ordinary materials known to everybody,—nitrogen, potash, phosphoric acid, soda, magnesia, etc., in certain forms, on soils that were absolutely sterile,—plants could be produced perfect in all their parts. That was the first point to be ascertained. Then to ascertain whether it was needful for the farmer, with such soils as were within our reach, to use all the elements of plant-nutrition, or whether the soil could be relied upon certainly to provide certain elements in sufficient abundance so that the farmer need not apply them.

The experiments for four years seem to indicate that, with such soils as we were using, gathering them on the College farm and for miles around, we need not apply to the plant carbon in any form, state or condition; that that was provided by nature, and always would be; that we need not feed any other organic element of nutrition but nitrogen; that nature had not provided nitrogen in sufficient abundance, and that we must apply it. Among the mineral elements of the soil, it was found that we need only use potash and phosphoric acid for our vegetable crops. There were one or two crops where we decided that we should use, not only potash and phosphoric acid, but magnesia. Tobacco was one, oats was another, where we decided that it was necessary to use magnesia; but for the ordinary crops on such soils, mark you, as we had to experiment with, nitrogen, potash and phosphoric acid were the only elements needed to be used. And we also noticed that there was a remarkable relation existing

between the amount of crop produced and the quantity of the elements applied, which led to the thought that, perhaps, with a certain quantity of nitrogen, potash and phosphoric acid given to the plant, in the form of absolute food, a plant might be produced which should contain as much nitrogen, potash and phosphoric acid as we gave artificially to the plant we cultivated. The results of open field-culture in 1873–74, which we reported at the last country meeting of your Board, seemed to sustain that belief.

Now I go on with the experiments of this year. The crops experimented with this year have been corn, oats, hay, beans, and the general garden vegetables.

And, first, if you please, I will take the experiments with corn. I hope I have so stated the principle that it is clearly understood. Two plots of land were taken this year, so far as we could determine, exactly alike in their quality. It was proposed to make, over and above the natural product of the land, fifty bushels of corn to the acre. Elements containing as much nitrogen, potash and phosphoric acid as would be contained in fifty bushels of Indian corn, and the natural production of stalks for fifty bushels of Indian corn, were therefore applied to the land. The result of that experiment was this: the land without the manure yielded twenty-five bushels of corn, in round numbers; the land with the manure yielded seventy-four bushels. That is, the crop was one bushel less than the statement, being forty-nine bushels, nstead of fifty bushels.

For potatoes, two plots were taken. These two plots were the plots which were planted with potatoes last year; the same plot without manure, the same plot with manure, as in 1874. The statement was, the materials should be applied to make one hundred bushels to the acre more than the natural production of the land.

Now, do not be surprised at this result. I see Dr. Nichols here, and some other scientific gentlemen, and perhaps they can explain it. The land without the manure made one hundred and twenty-eight bushels of potatoes to the acre; the land with the manure made two hundred and seventy-nine bushels to the acre, or fifty-one bushels more than the state-

ment. I will not stop to answer the question why. Dr. Sturtevant can answer that.

Now, I will give another experiment with corn, which will perhaps answer this query, why the land yielded fifty-one bushels more of potatoes than the statement called for, and I will answer another question which by and by will be asked me. You will pardon me for this interruption of the direct course of the experiments. Some men will say, "Ah, but supposing you did do it, how does it leave the land? Haven't you ruined your land? Supposing you did doctor this land up with some chemical hocus-pocus material, haven't you ruined your land?" Now, then, to explain the discrepancy in the potato experiment, and answer this question at the same time, I will tell you the result of another experiment with corn. In 1874 we were trying the experiment of growing corn according to this principle, and we raised one hundred and four bushels to the acre. In 1875 we took that same plot and planted it with corn again, and did not give it any manure at all, the object being to see if the land was ruined, or whether the manure of 1874 reached over into 1875, and affected advantageously the crop of 1875. On that plot, this year, we harvested sixty-four bushels to the acre, without any manure. The normal bearing of the land in 1874—that is, on the plot where no manure was applied—was thirty-four bushels to the acre.

Now, then (if it will be accepted as such), the manure of 1874, after producing its one hundred and four bushels to the acre, reached over into 1875, and gave us twenty-nine bushels and a fraction of corn to the acre this year, as the effect of last year's manuring.

Oats.—A presumptuous statement was made in relation to the growing of oats. The statement was made, that we would grow fifty bushels to the acre, over and above the natural product of the land. I ought to stop here to say to gentlemen who have never been at the College, and do not know anything about the land selected for these experiments, that we have got the poorest land, apparently,—rocky, drift soil, discouraging in every way,—on which to try our experiments. The plot without manure gave us fifteen bushels of oats to the acre. The statement was fifty bushels more than the

land would naturally produce. The yield of the manured plot was sixty-two bushels to the acre, or three bushels less than the statement; the land with manure producing sixty-two bushels, the land without manure producing fifteen bushels.

Hay.—Two plots of land were selected for the experiment with hay. The land had not been manured or ploughed for many years. The statement was, that there should be made on that land one ton of hay to the acre more than its natural product. The elements were accordingly applied, by top-dressing in the spring, which was wrong perhaps. The yield of the unmanured land for both crops was one thousand seven hundred pounds to the acre; the yield of the manured land was three thousand six hundred pounds to the acre, or one thousand one hundred pounds to the acre less than the statement.

Beans.—The statement with regard to beans was, that we would make twenty bushels to the acre more than the natural product of the land. Twenty bushels of white beans is a pretty good crop to the acre; but that was the statement,—twenty bushels to the acre over and above the natural product of the land, which it was supposed was nothing, the land being about as poor as could be. The result was, that the land without manure yielded four bushels; the land with manure yielded twenty-five bushels. We got one bushel to the acre more than the statement.

I believe that completes the record in relation to the exact experiments that have been tried on the farm. Now, I suppose, very likely some farmer may say, "This may all be true; it may be all very well to take a few small plots of land" (and our plots are either quarter acres or one-eighths) "and with the chemist of the Board of Agriculture to watch the kinds of material that you use, and a professor of agriculture who hasn't anything to do but try experiments,—with all these things combined, you might probably succeed in doing something in this little, silly, boyish way; but if you should go out on the land, and take an acre, and apply the materials in the ordinary way of farming, you would miserably fail."

Now, to meet that objection, we have been out on the land, and tried it in the ordinary way; and I will give you the

result. I selected, within half a mile of the College, two pieces of land that were thrown away, because they were not fit for any farming purpose. We took them simply as common lands, because nobody claimed them as farm-lands. One piece contained one hundred and fifty-four rods, and the other one hundred and ninety-two rods. The materials were applied on each of them according to the quantity of land to make fifty bushels of corn to the acre, in precisely the ordinary way of farming; no plot was selected to test what the land would naturally bear. The plot which had one hundred and fifty-four rods of land yielded sixty-four bushels of shelled corn, or ninety-eight bushels to the acre. The plot which had one hundred and ninety-two rods in it yielded ninety bushels of shelled corn, or within a fraction of seventy-five bushels of corn to the acre. The land was worked, as I say, in the way in which farmers ordinarily farm it,—simply taking the land and taking the material to make a certain amount of corn, and throwing it on, without any regard to what the land would do, —and that was the yield.

Now, gentlemen, indulge me in saying this one thing: the plot which produced seventy-five bushels of corn to the acre, and the plot which last year (1874) produced sixty-two bushels of corn to the acre, with no barn-yard manure,—it has not had any since the memory of man runneth,—this same plot—poor, cold, sandy as it could be—produced last year sixty-two bushels, and this year it produced seventy-five bushels to the acre. That land has not been hurt any by the process.

Now, some gentlemen will say, "All this was done under your own eye, and you had Dr. Goessmann, the professor of chemistry, right by those fields, and he could analyze the materials you used, and you knew just what you were doing; but we could not do it on our farms." Very likely. But indulge me, gentlemen, in saying this: that what has been done on the College Farm has been done on more than two hundred farms this year, scattered all the way from Vermont to North Carolina.

After the publication of those experiments at Westfield, a year ago, numerous applications were made to me for the formulas of the materials. I do not know who has bought the materials, and used them, but the formulas were sent to a

great many farmers in Eastern Massachusetts. People applied for the formulas, and received them. Whether they obtained the materials, and used them, I know not, except in one instance. I see Dr. Sturtevant, of Framingham, here; he received the formula; and although I have not said anything to him about it, nor he to me, I am told that he used the formula, and got a crop of corn. After I have done, you may have the pleasure of hearing the result of his experiments. I do not know but others in Eastern Massachusetts have done the same thing.

Now, that this thing might be settled, and without my knowing where they got the material, or how they used it, or anything about it, I furnished the formula, and I have written to a few farmers in different sections of the country whom I knew or had heard were trying the material, and I will give you the result. I give it to you, of course, just exactly in farm fashion. I know nothing of where they obtained the material, or anything about it, only they wrote me the results.

Charles F. Fowler, of Westfield, says:—

"We sent and got the material, and put it on to a 'pine plain land,' for five acres of corn, and thought the land would naturally grow about ten bushels to the acre."

He applied the material,—so many pounds, about enough, he says, for fifty bushels to the acre,—and harvested on the five acres forty-five bushels to the acre of shelled corn.

Mr. Henry N. Phelps, of Southampton, says:—

"I made an application, on three acres of land, of what I supposed, according to your formula, would produce forty bushels of corn. It yielded fifty-two bushels to the acre of shelled corn on the three acres. I applied on an acre of land in grass, which had not been ploughed for twenty years, or manured for three years, enough of that material to produce two tons of hay to the acre. It did produce me, by weight, three and a half tons."

Hon. Hinsdale Smith, of Feeding Hills, West Springfield, says:—

"I sent to New York and got the materials, as you told me, and applied them to twenty acres of land for corn. The land—one-half of it—was good corn-land; the other half was solid clay, very much

broken. I harvested, on the average, from the twenty acres, forty-five bushels of shelled corn to the acre. That was estimating seventy-five pounds to the bushel."

Hon. A. C. Parsons, of Northfield, writes :—

"I bought $30 worth of the material, as recommended, and put it upon a sand bank that was a bar on the Connecticut River, where the freshets washed repeatedly across, leaving a bar of coarse sand. It yielded one hundred and three baskets of corn, which I call fifty-five bushels, to the acre, which was more than my best meadow-land produced, freely manured with unleached ashes."

Another farmer in Northfield says :—

"I obtained from New York the material for three acres of corn. I estimated the land would not bear anything; I don't think it would."

He says :—

"I put on enough for fifty bushels of corn to the acre, and from the three acres I took sixty-five and a half bushels to the acre."

He reports nearly the same result in relation to potatoes, and further says :—

"I have a magnificent crop of tobacco now hanging on the poles. Of course I cannot tell what it will weigh."

H. C. Comins, of Hadley, president of the Hampshire County Agricultural Society, says :—

"I took one measured acre in my meadow, of good alluvial soil, which, however, had not been ploughed or manured for six years. I put upon it $20 worth of materials, and I have harvested from that acre ninety-three bushels of shelled corn."

Let that suffice, gentlemen, for the experiments. Now, allow me to draw some conclusions; and I would draw no conclusion any further than my experiments have gone. I would stand exactly on them; I would be taught by them; I would advance no theory that the facts do not sustain. For in these matters I have gone to nature with questions, and I have tried to interpret the answer, and to interpret it in such a way that we may make it practically available to all the

farmers of the community. Now, the first conclusion at which I arrive, as the result of these experiments, is this: that it is possible to make these poor, worn-out fields of old Massachusetts flourish with waving grain, corn and grass, by the use of the chemical elements of plant-nutrition. Does anybody dare, after these experiments, to dispute the statement? It is possible, I say, to make these old, worn-out fields of Massachusetts flourish with grain and with grass, by the use of the chemical elements of plant-nutrition. My next conclusion is this: that in order to do this, it is not absolutely necessary,—and I want to put it stronger than that, —it is not *desirable* to keep cattle for the sake of making barn-yard manure to do that work with. Now, some men will dissent from this. I say that it is not desirable to keep cattle *for the express purpose*—mark the language—of making barn-yard manure to renovate these fields with. I know some of my brother farmers will say, "Well, you are going back on barn-yard manure, ain't you? You are going to say barn-yard manure isn't worth having; that you wouldn't cart barn-yard manure a mile, if anybody would give it to you." Not at all, gentlemen. I tell you this: barn-yard manure is the waste product of certain industries. There is horn waste and bone waste, the waste of the woollen manufactories, and the waste of every kind of manufacturing, that have elements of fertility in them. Never waste them. Barn-yard manure is simply a waste product, for we must keep cattle or horses to do our work on our farms. We must make milk and butter and cheese; and in this business of making butter and cheese, and in keeping stock of any kind to run our farms, we must make barn-yard manure. Then you commit a sin if you waste it. Husband your resources of every kind; husband your waste material, whether barn-yard manure, wool, waste horn, waste hair, or whatever it is, because they all contain elements of nutrition; but I venture to prophecy, that the commercial value of barn-yard manure in future is to be determined by the commercial value of the chemical elements of plant-nutrition. But do not understand me as saying that barn-yard manure is not valuable, and should not be saved, or that all your resources of this kind should not be husbanded the same as ever.

Now, I have not told you anything new, gentlemen. Dr. Nichols of this town proved, long ago, that a farm can be renovated without the use of barn-yard manure; and these experiments have only gone to substantiate the fact which was brought to the notice of the Board at the meeting in Framingham.

My next conclusion, as the result of these experiments, is, that this method of feeding plants is the cheapest of all known methods of producing them; the cheapest in the world,—cheaper than barn-yard manure, cheaper than anything known. Of course, I am met by the question, "What does it cost?" I have tried to put it into figures, gentlemen, so that it could be understood. I should say, before reading this,—if you will excuse me,—that in order to bring this matter to a rule, a most extensive series of experiments and investigations have been carried on at the College in the years prior to this year, to ascertain the natural and healthy relations between the straw of all our grains and the grain itself; between the tops and tubers of all our root crops, etc., going round the entire range of our crops; and the present year the whole ground has all been gone over again, that it might be verified, and all mistakes corrected. In this estimate we put, of course, the cost, not only of the grain, but of the stalks; and, therefore, in estimating the value, we estimate, not only the value of the grain, but the value of the stalks. The nitrogen, potash and phosphoric acid to make a bushel of corn, with its natural proportion of stalks, costs forty-one cents. That is about the price of the materials this year. Of course, these are commercial products, and may fluctuate slightly. Now, if you call a bushel of corn worth seventy-five cents, and allow ninety pounds of stalks to the bushel (and, I suppose, Dr. Sturtevant will say it is more), in marketable condition, and call the stalks worth $8 a ton, the stalks are worth thirty-six cents; so that the corn and stalks are worth $1.11, and the materials for their production being worth forty-one cents, a balance of seventy cents is left for your labor, for your taxes, and the interest of your money invested in the land. Now, gentlemen, don't get heated over that excessive profit!

One thing more, and I will relieve you. Take the statement, now, and apply it to the result of the experiments which

I have already given you. I applied the material for fifty bushels of corn to a piece of land, and my crop was ninety-four bushels. This is the other side of it. Now the corn on that piece of land, at seventy-five cents a bushel, amounts to $102.52, and the stalks to $32, on that acre of land. Now the cost of the material is to be taken from the value of the crop. The cost of the material for the fifty bushels of corn was $20.50. I got ninety-four bushels of corn for $20.50, and I have got $82.02 on my crop to pay for my labor, my taxes and my interest,—it being supposed that in Massachusetts, ordinarily, the natural yield of the land will pay for the labor, its taxes and its interest; and if it will not do it, you had better sell it and buy land that will,—this question being simply a question of feeding plants above what the natural production of the land is.

I thank you, gentlemen, for your attention and your patience.

Dr. Wakefield, of Monson (who was called to the chair in consequence of Dr. Loring being obliged to leave). You have heard the interesting experiments of Prof. Stockbridge, and the conclusions drawn therefrom. The next subject is a discussion upon Indian Corn and the Grain-crops. Mr. Hapgood, of Shrewsbury, is understood to be ready to open this discussion.

Mr. Hapgood said:—

The grain-crop always was, and always will be, the great staple of the civilized world, the very foundation of agriculture, and the most important of all crops.

There has been much said and published the last three or four years to discourage New England farmers from cultivating grain-crops, especially Indian corn, which has succeeded too well in persuading many to discontinue raising any kind of grain; but they have learnt by the experience of two or three years that it is cheaper to raise grain than to buy it, and many of them have gone back to the old mode of raising grain and general farm crops, which is the only profitable way of farming.

I shall address you principally on the corn-crop, to which I

have given considerable attention, and am to some extent a corn-fancier.

I think it is the richest, the most beautiful, and the most stylish of all the cultivated crops. When the blade first shoots out of the ground, it pricks up like the ears of a race-horse, and in every stage of growth it is beautiful. What is more beautiful than a well-cultivated field of corn, stretching away in straight rows till they become blended in one waving mass of luxuriant foliage?

I have a mode of cultivation which will produce a yield of eighty bushels or more of shelled corn to the acre; also a rule for estimating the yield of a field of corn, which I will describe to the meeting, and then show samples of the corn.

I prefer sod-land for corn, ploughed in autumn, six inches deep and no more, and ploughed with a swivel-plough. When I commenced farming, I bought a Holbrook and an Ames Plow Company swivel-plough, and have never used, and never intend to use, any other kind of plough. I would not have my land ploughed into dead furrows and ridges with a land-side plough, if it were done for nothing. These swivel-ploughs were not so good as I wanted, and so I made a new one, which will do one-quarter more work than the old swivel-ploughs with the same power of draught, and do the work better, too.

The field on which the samples were raised, which I have here and shall show, was ploughed last autumn. In the spring I spread on five cords, or fifteen two-horse loads, of stable manure to the acre, which I worked in with a Boston horse-hoe and a Geddes harrow. I then furrowed the field three and a half feet apart each way, and laid a moderate shovelful of stable manure in the hill, which takes about ten two-horse loads to the acre, making twenty-five two-horse loads of manure to the acre of corn, which is as much manure as I think is economy to use. From my experience, I am confident that for every additional load of manure the yield of any kind of grain is not increased more than one bushel to the load, and the yield of hay not more than one hundred pounds to the additional load of manure. In seeding, I plant five kernels to the hill, no more, nor less; this is pretty sure to make four stalks to the hill, which is as much as I intend shall grow. When six to eight inches high, I hoe it.

Once hoeing is enough, if the field is free from weeds. My corn this year was hoed but once. The style of cultivating corn is very various. Some farmers spread manure on grass-land and plough it under six inches or more; some never lay manure in the hill; some hoe when it is no more than three inches out of the ground, and hoe two or three times, and so on; but the proof of the pudding is in the eating of it, and the test of excellence in farming is always in the yield of the crop. I never adopt any new mode of cultivation, however simple or however elaborate, which yields a smaller crop than I now raise, or that does not produce definite results in bushels or pounds. There was a recent communication in an agricultural paper, reporting a yield on one field, with chemical fertilizers, of eighty-two bushels of corn to the acre, at a cost of twenty-seven cents a bushel, and another field of one hundred and fifteen bushels, at a cost of twenty-two cents; that is all; no details in the mode of preparing or applying the fertilizers, or manner of cultivating the crop. Now, I will show samples of the corn. This is a sample of the three largest ears of my crop this year, 1875. These ears were fourteen inches long when harvested. They may have shortened some, for an ear of corn that measures fourteen inches at harvest, will shrink one-half an inch or more in drying. There are sixty kernels in a row on these ears, and four hundred and eighty on an ear, or four hundred and eighty kernels of yield for one kernel of seed. The weight of these ears is two and a half pounds, ninety-six ears of which will make a bushel of corn at seventy-two pounds of ears to the bushel.

Here is a sample of the average length of ears of my crop. These ears measure eleven inches long. The weight of these average ears is one pound and fourteen ounces, requiring one hundred and twenty-five ears to make a bushel of corn. The yield of my crop, from which these samples are taken, is eighty-one bushels and a fraction to the acre. My estimate of the yield was eighty bushels to the acre, before the corn was harvested. My rule for estimating the yield of corn is principally from the length of the longest ears. For example: show me ten of the longest ears from an acre of corn, on which the crop is of even growth on the whole yield, and the average length of ears will be three inches shorter than the

longest ears. This difference in the longest and the average length I have found to exist almost to a certainty in all my observations on the yield of the corn-crop.

If the rows in the field are three and a half feet apart each way, we have about twenty-three hills of corn to the rod of land, and, with four good ears to the hill, we have ninety-two ears. But the large varieties of corn will not average four ears of corn to the hill; three ears of corn to the hill, eleven inches long, will make a bushel of corn to two rods of land, or eighty bushels to the acre.

Here are three of the largest ears from a field of two acres in my neighborhood. These measure ten inches long, and the average length of ears in this field will certainly be about three inches shorter, which will make the yield one-third less than if the longest ears were fourteen inches long, or fifty to fifty-five bushels to the acre.

This sample was grown on sod-land, ploughed in the spring, on which was spread about twenty-five two-horse loads of stable manure, and ploughed under six inches deep or more; then it was dressed with a compost of hen-manure in the hill. I disapprove, decidedly, of spreading manure on grass-land, and ploughing it under. I have never seen, in a single instance, a large crop of corn raised by that mode of tillage. The variety of seed-corn planted is a very important consideration. It is not possible to raise a large yield of corn from a small variety of seed; and yet many New England farmers persist in raising these small varieties, which, with high cultivation, will produce scarcely more than fifty bushels to the acre; when, with a large variety of corn, and at the same cost, they might raise eighty bushels or more to the acre. They claim that their corn has many stalks with double ears; but the proportion of stalks with two good ears is not very large that I have ever seen. Then they argue that small corn has a small cob, and is filled out well; it makes good meal, and they like it; that big, coarse corn has a great cob, and they do not like it. Some farmers stick at the cob, as if that was the first object, without regard to the corn. After all, there is but little difference in the weight of cob to a bushel of corn, in the large or small varieties.

Seventy-two pounds of ears of my corn will make a bushel,

or seventy pounds when it is well dried; so there is not much weight in the cob argument, after all. With one dressing of twenty-five loads of manure to the acre, I raise eighty bushels of corn. Then I sow to barley, and seed down to grass; the next year after, corn. I have thirty to forty bushels of barley to the acre; then, the two following years, about two tons of hay to the acre; after that, one and a half tons; then one and a quarter tons,—so I raise five or six crops with one dressing of manure.

I will now describe my method of harvesting corn. I never cut off the top stalks; it is labor lost. When the corn is ripened so that the husk begins to loosen from the ears, I cut it down to the ground, and lay it in bunches of six to eight hills each; then lay rye-straw for single bands, and bind it in bundles. Then, with a pole and cross-pin, I stook it, putting eight to ten bundles to a stook, and bind the stook with one band only. When the corn is well cured, I take the band off the stook, and put the bundles on to a wagon with a pitchfork, and unload the wagon also with a pitchfork. When I husk the corn, I unbind two bundles, and tie the two single bands together. When husked, I bind what was two bundles of corn into one bundle of husks. Then I can move the husks conveniently with a pitchfork to any place I wish to put them. I have found this the most economical and the most convenient way to harvest corn. The first year of my farming I stooked my corn without binding, but found it ugly stuff to handle, to put on or take off the wagon, or to move about in the barn.

I have found corn-stover valuable feed for cattle. If cut up with a machine, it is worth as much as English hay, ton for ton. The stover of my corn is large; it grows ten or eleven feet high, and will weigh two and a half tons or more to the acre. It will more than pay the labor of raising the crop.

I have kept cows from the first of November to the first of April on cut corn-stover, wet, with one quart of shorts for a flavoring, and one feed morning and night, and dry stover at noon, and no other feed of any kind. Cows will keep in as good condition, and give as much milk, as if fed on English hay. I feed in tubs made of flour-barrels, cut in two. For a cow of size to make six hundred pounds of beef, I feed one tub-

ful, well tamped in, morning and night, and the same quantity at noon, dry. With my mode of cultivating corn and feeding the stover, I have found it the most profitable crop raised on the farm.

Dr. E. L. Sturtevant. Last spring, the Sturtevant brothers found themselves in the condition of very many other farmers. They desired to put in quite a large area of corn, and they only had the manure for a small portion. Accordingly, I, with one of my neighbors, went up to Amherst and had a conversation with Professor Stockbridge in regard to his corn-crops; and the Professor very shortly convinced us that we could use chemical fertilizers with advantage on our farms. In speaking of chemical fertilizers, I do not wish to be understood as comparing manure and fertilizers. That is not the question that I am talking about. The question which occurs to most farmers, is, as Professor Stockbridge has very well put it, "After all our other manure is used up, what are we to do? Can we use chemical fertilizers with any profit?" We returned from Amherst immediately, and laid in our stock of chemical fertilizers. We tried two experiments. The first in order was an experiment with the manures; the second with fertilizers; and the study of these corn-crops this year has opened up many interesting features. The first field contained in the aggregate $2\frac{7}{10}$ acres. It was planted in the ordinary way, at the proper season, before the drought of this year, and was manured with $5\frac{2}{10}$ cords per acre of the best cow-dung. The field had been in grass previously, and was only bearing perhaps from one-third to one-half of a ton of hay per acre. It had only borne about one-half a ton the preceding year, and we had thought that the field was exhausted. We planted two varieties of seed. Of the first and best variety we had but eight quarts. We could not get any more of the same seed, and, therefore, we got elsewhere our supply of seed for the rest of the field. The corn was cultivated in the usual way, and, at harvest-time, a portion of it was topped, and a portion was stooked, as was dictated by convenience. The committee of the Middlesex South Agricultural Society viewed it, and recorded a yield of one hundred bushels to the acre. One portion of this field,

containing eleven rows, had received no manure. This portion gave us sixty-eight bushels to the acre. The yield of the whole field I cannot give you yet, because it is not yet all husked; but the upper portion of the field, where we planted the best seed, has certainly given a large increase of yield over the lower portion, where the other seed was planted. Off of three-quarters of an acre and one-sixteenth, we harvested, by actual count, one hundred and sixty-five piled baskets of ears.

The second field to which I refer contained exactly $8\frac{6}{100}$ acres, and it was manured with the chemical fertilizers, according to Professor Stockbridge's formula. We applied to the field enough fertilizers to give us $60\frac{1}{2}$ baskets of increase. It was cultivated similarly to the manured field, although it was planted later, and the seed did not germinate for a long time, on account of the drought. It was some three weeks before the rows could be seen through the germinating of the corn. It was, therefore, later than the manured field throughout the whole season, so that we felt very solicitous in regard to the yield. The same committee of the Middlesex South reported the yield of this field at $82\frac{1}{2}$ bushels to the acre. Two unmanured rows, seventy-two rods long, gave a yield of twenty-two bushels, leaving an increase of $60\frac{7}{10}$ bushels per acre,—differing two-tenths from what Professor Stockbridge stated. These, however, are cattle-show measures; that is, the product of a square rod, multiplied by 160, and divided by 72. We have, however, harvested this eight-acre field, and have the corn all in bins; and, by measuring the bins, we are enabled to get at the exact bulk of corn. The actual yield in bulk—calling two bushels of ears equal to one bushel of corn—is $67\frac{1}{2}$ bushels per acre.

Having given these statements in a brief manner, I will proceed to analyze the crop in reference to what we learned from it. The first and most marked observation is the influence of seed. I have no question in my mind but that if all the seed had been of the first quality, the yield would have been from ten to fifteen, and perhaps twenty bushels more to the acre. The second observation that I refer to, is the influence of the nearness of planting and the number of

stalks in the hill. It is obvious, that if every stalk bears an ear of corn, the more stalks that can be obtained upon an acre, the more ears, and if the ears are of the proper size, and in proper condition, the greater the yield. Therefore it is desirable to get as many stalks upon an acre as your land and good culture will allow you. Our corn was planted in hills thirty-eight inches apart, and we dropped from three to five kernels in a hill. In the condition of our land the larger number of kernels furnished better results than the smaller, and in most of the hills almost every stalk produced an ear, and many two ears.

The next thing to which I will refer as being taught, is the influence of cultivation; and this brings me to the most important lesson which can be drawn from the whole culture, —the influence of cultivation. And now, if you will excuse me, and bear this statement in mind, I will go back a little, and take up the fertilizer. When we apply our fertilizer to the field, we know absolutely that that fertilizer is capable of raising a crop. The Professor has stated it here very strongly. I might add strength to his statement by referring to the experiments of Stohman, in Germany, who cultivated corn by water-culture. The corn was first germinated, and after the roots had obtained all the nutriment from the seed, they were transferred to water containing the ash of the corn-plant, and double the amount of nitrogen that there was of phosphoric acid in the ash. The ammonia was applied in sufficient quantities to give three parts of solid substance to a thousand parts of water. These plants were grown to the height of seven feet, and ripened their crop, which shows conclusively, beyond argument, that these materials—the ash element of the crop, and nitrogen—are capable of yielding a crop; and it also brings out another point: that if the elements are brought in contact with the roots, the crop can be grown from those elements. There can be no question about that. Here the Professor's theory and my statements agree; but the great question in raising all our crops is, how to bring the elements of fertility into contact with the roots. There is the practical question which underlies chemical farming, and if the Professor had taken more time, and had given you more careful details of the culture which he proposes, I

should have been glad. I think his system is capable of bringing fertility into Massachusetts, enabling us to raise corn profitably by the purchase of our manures. But how must we apply those chemicals? We know more about chemistry than we do about almost any other subject connected with agriculture. I will speak now of these agricultural chemicals in a soluble form. We know that when these chemicals become soluble in the soil, the soil exercises a decomposing action upon them; that they are separated into their component parts, and while a portion escapes through drainage, another portion remains fixed in the soil; and we can say with regard to the phosphoric acid fixed in the soil, that there is no escape through leaching. It remains absolutely fixed. The potash is more diffusible, and some of it does leach through the soil, but only to a very small extent. The nitrogen, in the form of nitric acid, escapes very rapidly; in the form of ammonia, it is fixed to a large extent. I also know, from the record of certain experiments with turnips, and also from my own observation of the influence of chemicals upon corn roots, that the presence of certain chemicals develops the fibrous matter of the roots.

Let me quote an experiment where plants grew in cylinders filled with very poor clay earth, in which the chemicals were placed in a symmetrical manner in the soil,—one cylinder had the fertilizers in the centre, another had them arranged around the circumference, etc. It was found that the roots extended without many fibrous branches until they reached the fertilizers, and then they distributed themselves with their innumerable mouths to take up these fertilizers. Now, in growing the corn-crop this year, we placed all our fertilizers upon the surface of the land. What was the result? The result was that we had a greater root-growth near the surface than at lower depths. The moisture of the season probably saved us from a total loss, because, when the short drought came this fall, our corn wilted so that the ears hung down. Now, if those roots had received that nutriment in a lower portion of the soil, they would have been out of the reach of the drought. How, then, can we apply these chemicals, in order to get the best effect from them? Evidently, reason answers, "Study the nature of the elements, and apply them

rationally." Phosphoric acid is very little diffusible in the soil. If you apply it to the surface-soil, and pour water upon it, it will pass down only a very short distance before it becomes fixed, and the roots have to approach the surface to come in contact with it. To apply phosphoric acid rightly, it should be put in deep,—ploughed in three, four, five or six inches deep. The potash, being more diffusible, might be spread nearer the surface. The nitrogen, in whatever form you apply it, being rather diffusible, should be applied upon the surface. In that way, we have taken the best precautions for giving our crop its food during the period of growth.

Now, having planted our corn upon a chemically fertilized field, the only question with the crop is to have these chemicals in contact with the roots during the whole period of growth. There can be no question, if there is enough fertility in the land, if that fertility is in a soluble form, and if the roots come properly in contact with that fertility, that the result will be a good crop. But what is the fact about roots? The roots occupy but a comparatively small area of soil. They feed from the extremities. They pick up their nutriment through the rootlets which are upon the small fibrous roots. Plants differ in the depth to which their roots penetrate. You can dig down into the soil where corn is growing, and you will be able to trace the corn-root down as far as you can ordinarily go. In one experiment as to the depth of roots, I found, upon land which had not been manured for fifteen years certainly, and probably for a longer period, and which yielded about one-third of a ton of hay to the acre, the grass-roots extended down twenty-five inches. These different roots extend to different depths, and they have different habits of growth, and the nature of the soil stimulates the growth of these roots to a different extent, according to the different kinds of plants. But confining myself to the corn-plant, I will state that the corn-roots extend laterally as well as downward; that they cover the whole space upon which they grow with immense rapidity. It is hardly conceivable how fast the roots of the corn-plant are formed; but they extend out laterally. Starting from the plant, they put out a few fibres throughout their length, and in a short time the tough coating of all the roots is incapable of taking up any

food, and the extremities of the roots, through their extension, seek their food from a distance. Now, if there were any way whereby we could bring these fibrous roots back again, and make them occupy the whole of the soil; keep them from striking off in random directions, and make them fill the soil more completely, so that a large portion of the soil will be filled, then we can extract the utmost amount of the fertilizing power contained in that soil which the plant is capable of appropriating. This, I think, can be done.

Pomologists have known for a long time that root-pruning increases the yield of apple-trees, and increases the area covered by the roots. I have here the roots of two apple-trees,—one root pruned this last spring, the other not pruned. In my left hand I hold a root showing the effect of root-pruning; in my right hand, a root which shows the natural growth. When you cut off the root of a tree, immediately from the cut surface are put off small fibrous roots, and when you remember that it is only the small, young roots which take nutriment, you can see how immensely you add to the power of the plant to take nutriment from the soil by pruning, and thus increasing the number of the fibrous roots. You take a corn-plant and divide the root, and what happens? In less than twelve hours you will find that that root has commenced to throw out small roots which are almost innumerable. These roots seek out the nutriment in the land, and grow rapidly. The growth of the leaf of the corn-plant is stated to be about five inches in twenty-four hours, and it is probable that for each inch of the growth of the leaf there is a growth of several inches of these small fibrous feeding roots, which occupy so many of the interspaces of the soil, and take so much nutriment from it. Now, if we can change the roots nearest the plant from those coarse roots into innumerable small roots, we are giving that plant greater command over the fertility of the soil near the plant. In other words, we carry the roots to the chemicals, as well as carry the chemicals to the roots. Then, in a short time, if we cut the roots at a further distance from the plant, other fibrous roots are caused to develop, and these send out fresh fibres, and the plant has still greater control over the fertility in the soil.

Now, there is another point here, which is a physiological

law. You can put a plant upon an extremely fertile field,—a field too fertile for it,—and the result is that the powers of the plant are expended in the growth of leaf, not in the development of fruit. You all know that. Now, if you can induce a check to that plant, without injuring the vitality of the plant, you have changed the forces which are being expended in too luxuriant growth of leaf, into forces of fruitfulness. Therefore, by this check which you get in root-pruning without destroying the vitality of the plant, you are changing the forces of the plant itself to the production of fruit instead of the production of leaf. The result is, that root-pruning will tend to increase the number of ears to the stalk of the corn; and, in fact, we all know in practice, that the better farmers cultivate their corn the most, and those farmers who cultivate their corn the most usually get better results,—that the results are larger in proportion to the cultivation. I don't know the largest number of bushels of corn that have been produced to the acre, but we have a record of one field in Ohio which is reported to have given two hundred and sixty-three bushels of shelled corn per acre, and another field in South Carolina is reported to have yielded two hundred bushels of shelled corn to the acre. Now, if by means of a preparatory study of the fertilizers to be used, the proper distance of planting, and the proper culture, we can give the corn-plant an increased advantage over the soil as it exists, we have increased our crop, and increased it very largely indeed.

Another thing. By checking the luxuriance of the leaf, you can plant your corn nearer together, and can get better results, because you get more stalks and more ears on the same area of land; at the same time you increase the tendency of the plant to bear more ears to the stalk. This idea, which I call a new theory in agriculture, because it thus far appears to have been overlooked, has been developed, I think, through the study of the corn-plant growing this year; and if chemical fertilizers are to be used with advantage, this theory is a very important one to be considered; for it enables the farmer to take advantage of the capital which he applies, in the form of fertilizers to his land, and to get from it its most advantageous results before it has time to be wasted

from the land. But in applying chemical fertilizers to the corn-crop, we must be very careful to understand the conditions, as I said before, under which we apply them. The chemical fertilizer, rationally applied, I have no doubt will bring the desired results to whoever uses it; but there is no quicker way for a farmer to lose money than to buy chemical fertilizers and apply them without understanding the application. I am tempted to give an illustration as proving this point, and it may be of interest in itself. I will answer for the truth of it, although I do not care to give names. A gentleman, who is a manufacturer, but who is interested in farming, has quite a large farm, and cares more for results than he does for the expense of getting them. He has, among the waste product of his mill, the refuse of the burring-machine, which takes the burrs from the wool. It is almost clear wool-fibre. An analysis of that shows that it contains some fifteen per cent. of nitrogen, some two per cent. of potash, and but very little, if any, phosphoric acid. This wool-waste, one inch in depth, was placed under the soil seven inches deep. He had a man go along and push this wool-waste under the furrow as it was turned over. He planted grass-seed, and this year he harvested from that field twenty-five tons of hay from five acres. I saw the hay myself, and it was a noble sight for a farmer to look on. He was so successful in this experiment that he thought he would apply this manure to other crops and see how it would act.

He ploughed up quite a large field, and, except on a strip perhaps four rods wide and twenty rods long, he put this wool-waste, until the soil was quite heavy with it. He sowed upon that field the ordinary flat turnip. I saw this field during the last days of October, and on that part where the wool-waste had not been applied, the leaves were of a very dark green, very short, indeed, and the plants looked sickly. But beyond this was a field of turnip-tops, which came up four inches above my knee, so thick you could not see the land, and the leaves of a bright, turnip green. As I was walking to the fields, and as the gentleman explained what he was doing, I said, "You will get no crop commensurate with the manure you have applied, but you will get leaf." The result was as I stated. Where there was no manure, there was a fair crop

of roots, and very little leaf; but on that part of the field where the wool-waste had been applied, the plants had gone almost entirely to leaf, rather than root. The lesson to be derived from this is, that these chemical fertilizers, applied wrongly, can bring no profit. As applied to grass, the wool-waste had produced a profit, but as applied to turnips, it had produced no profit; in fact, it had resulted in loss, because the turnips were not so good for it.

Mr. SLADE, of Somerset. Did I understand the Doctor to say that he applied the nitrogen to the surface for the corn-crop?

Dr. STURTEVANT. I would recommend applying nitrogen to the surface.

QUESTION. How much corn can Professor Stockbridge grow with seventy-five dollars, which he admits he paid for his manure?

Prof. STOCKBRIDGE. I do not know. I can only answer the question by referring to the experiments reported. Mr. H. C. Comins says, "I bought twenty dollars' worth of materials. I applied it to one acre of land, and got ninety-three bushels of shelled corn." Give me land enough, and with seventy-five dollars I can grow four times that amount in value of corn.

Mr. SLADE. I suppose there is not a gentleman here who does not intend to ask Professor Stockbridge for his formula, and I ask him if he will give it now.

Prof. STOCKBRIDGE. I see by Mr. Slade's manner of remark, that there is a feeling here that there is some secrecy about this matter. There is no secrecy whatever about it. It is all just as plain and open and as common, to a large proportion of men, as it is to know of the use of barn-yard manure or muck. There is nothing secret, there is nothing behind it. The inquiry is made for the formula. I did not expect that I should be asked to give the formula here, but to meet this want of the farmers of New England, all the formulas from which I have worked will be published in the report of the Agricultural College to the legislature, and go broadcast throughout the Commonwealth. I am willing to give to this audience my formulas, but I am not willing that the reporters should put them down, or that they should be published in

the papers of the day, because, as a loyal man to the Agricultural College, I think the public should get this information through the official channel of publication. That is all there is about it. I think if anything of value has been discovered in connection with this matter, it is their property; but if we have learned anything at the College, the farmers of the Commonwealth should get it through the College report. That seems to be the proper channel. There is no secret about it. I am willing that my friends should have every one of my formulas, but I am not willing that they should go out to the public in this way.

The form in which I have obtained nitrogen, potash and phosphoric acid to compound for the nutrition of plants in these experiments, has been in that of a neutral salt for the nitrogen and potash, and a superphosphate for the phosphoric acid. For root-crops and beans, I have used the potash in the form of sulphate; for grain and forage crops, in the muriate form. No specific rule can be given as to the quantity of the compounds to be used in preparing any of my formulas, because the percentage of nitrogen, potash and soluble phosphoric acid they contain is quite variable; but having learned the per cents. of the compounds, the required quantity is easily ascertained.

INDIAN-CORN FODDER.

To produce two tons of corn-fodder per acre more than the natural produce of land without manure, I should apply, of—

Nitrogen,	20 lbs.,	in form of	sulph. ammonia, 24 per cent.,	100	lbs.
Potash,	66 "	"	of muriate potash, 80 "	132	"
Phosphoric acid,	16 "	"	of superphos., 18 per ct. sol. acid,	128	"

INDIAN CORN.

The natural proportion between the grain of Indian corn and its roots, cobs, leaves and stalks, is, for fifty bushels of the former, at fifty-six pounds per bushel, four thousand one hundred pounds of the latter, and to produce the entire mass more than the natural product of the land, I use,—

Nitrogen,	64 lbs.,	in form of	sulph. ammonia, 24 per cent.,	320	lbs.
Potash,	77 "	"	of muriate potash, 80 "	154	"
Phosphoric acid,	31 "	"	of superphos., 13 per ct. sol. acid,	248	"

POTATOES.

The average proportion between tops and tubers has been found to be three hundred and sixty pounds of the former to one hundred bushels of the latter, and to produce that mass more than the natural product of the land, I use,—

Nitrogen,	21 lbs.,	in form of	sulph. ammonia, 24 per cent.,	105	lbs.
Potash,	34 "	"	of sulph. potash, 32 "	235	"
Phosphoric acid,	11 "	"	of superphos., 13 per ct. sol. acid,	85	"

HAY.

This formula is an average of my formulas for red clover, white clover, English hay and timothy. To produce one ton of hay per acre more than the natural product of the land, I use,—

Nitrogen,	36 lbs.,	in form of	sulph. ammonia, 24 per cent.,	180	lbs.
Potash,	31 "	"	of muriate potash, 80 "	70	"
Phosphoric acid,	12 "	"	of superphos., 13 per ct. sol. acid,	95	"

RYE STRAW.

In producing the straw of winter rye as a market crop, and without the growth of grain, and to produce two tons per acre more than the natural yield of the land, I use,—

Nitrogen,	10 lbs.,	in form of	sulph. ammonia, 24 per cent.,	50	lbs.
Potash,	31 "	"	of muriate potash, 80 "	62	"
Phosphoric acid,	8 "	"	of superphos., 13 per ct. sol. acid,	64	"

WINTER RYE.

The natural proportion between the straw, roots, leaves, etc., and the grain, is two thousand three hundred pounds of the former to twenty bushels of the latter, and to produce this mass per acre more than the natural yield of the land, I use,—

Nitrogen,	25 lbs.,	in form of	sulph. ammonia, 24 per cent.,	125	lbs.
Potash,	24 "	"	of muriate potash, 80 "	48	"
Phosphoric acid,	16 "	"	of superphos., 13 per ct. sol. acid,	128	"

Mr. GOODALE. I think every one here would be extremely glad to hear from Dr. Nichols upon this interesting subject.

Dr. James R. Nichols, of Haverhill. I have been very much gratified by the statements made by Prof. Stockbridge, because they fully corroborate the experiments I have made during the past twelve years. I think the gentlemen of the Board will bear me out when I say that it is now very nearly, if not quite, eight years since I presented to the Board statements corresponding with those made by the Professor to-day. And as it regards these new methods, as they are called, of raising corn, I think they indicate one very promising feature of the farming industry, because they indicate that progress is making in the raising of cereal crops.

Now, there seems to be a mystery about this to some of our friends. I can very well understand how they feel about these statements; but, after all, there is no mystery. The application of the principles of chemistry to the growing of crops is just as accurate as the application of the principles of chemistry to any of the industrial arts. We, to be sure, have many things to contend with, but we are from year to year getting nearer and nearer to a knowledge of the nature of these obstacles with which we have to contend; and in that, to my view, lies one of the most important principles connected with agriculture.

Now, in relation to the statements made here of the application of manures to crops, I have found in my experiments that that is of great consequence. I have every year, in the "Journal of Chemistry," under my charge, endeavored to enforce, and enforce repeatedly, the importance of the proper application of manures to crops; and I find that farmers will read these statements and forget all about them; they will make mistakes in the application of what are called chemical fertilizers, and lose their crops. I cannot quite understand why it is so. In the application of chemical fertilizers, it seems to me that it is—in fact, I know it is—a fundamental principle, that you must place your fertilizer beyond the place you deposit your seed. Any one who makes use of chemical fertilizers in the hill, as I have usually done, and places his seed in connection with the fertilizer, will be sure to lose his crop. Now, I have raised corn on one field for nine consecutive years, and my crop has never fallen below eighty bushels to the acre, and two years in succession I

raised two hundred and four bushel baskets full of ears from an acre. I do not say that that gave me a hundred bushels of shelled corn, but I think it came very near it. It was the most splendid crop I ever saw, and presented to the eye one of the most beautiful of objects; and I believe that by raising corn, we can not only obtain a profitable crop, but we diversify our fields with one of the most beautiful crops we can possibly raise. I happened to have a London physician visiting me in August, who had never seen a field of Indian corn. I took him over my farm, and when we came to a patch of corn, he was so delighted with the appearance of the crop, that he fairly clapped his hands with joy. It certainly is a beautiful crop. I cannot conceive why it is so neglected. In riding fifteen miles into the country the past season, I counted only three fields of corn. For some reason or other, our farmers neglect to raise this crop. I have kept an accurate account of the cost of corn raised by chemical fertilizers on my own premises. I believe I have no desire to cheat myself or my neighbors, and I estimate the cost of that corn at forty-one cents a bushel. I did not put so high a value upon the fodder as I think I ought to.

Now, the secret of raising corn profitably, is this. In the first place, you want a proper fertilizer; you want to make a proper application of the fertilizer; and then you want to spare yourself all the expense possible in the cultivation of the crop. I intend next year—but perhaps I may be obliged to defer it until the following one—to plant a field of corn on about eight acres of pasture which I have upon one of these lakes, and I do not mean to allow a hoe to be applied to it. I believe we can raise corn without the application of the hoe. It is the labor which is bestowed upon corn which makes it cost so high. We cannot afford to expend so large sums in paying our workmen, and then sell our corn at a low price. Then, again, we must raise large crops upon small pieces of ground. I remember my father used to think he got a good crop of corn if he got twenty bushels to the acre. Now, twenty, thirty, or forty bushels of corn to the acre will not pay; but eighty or a hundred bushels will pay.

I do not think that I could go quite as far as some of my

friends have gone in the statements that they have made in relation to the influence of soil. I think the original character of the soil does influence the corn-crop. I believe there are some tracts of land upon which you cannot raise corn successfully,—I have evidence which satisfies me of that fact,—and if a farmer has any of that land, of course it is the height of folly for him to plant corn upon that soil. It seems to me that you cannot raise corn profitably upon a dry, silicious plain. I do not know but that, by the use of these chemical fertilizers, you might raise a tolerable crop of corn, but my experience goes to show that you could not. You want a good fair soil, and you may use chemical fertilizers entirely; and in every case, if the season is moderately favorable, you can raise at least eighty bushels to the acre. Let me say here, that you may use for corn quite a variety of materials. For instance, a mixture of wood-ashes and very finely ground bone-dust. In that mixture, we get potash and we get phosphoric acid, and we get them in such a combination that I found in every case—and I tried it upon quite a number of fields—that I brought a most astonishing yield. But the material that I have used has been home-made phosphates, which I have made upon my own premises. I know that a great many farmers shrink from the attempt to make their own fertilizers; some have tried it, and failed; yet I think there is not a farmer in New England, of ordinary intelligence, who cannot manufacture his own superphosphate, and make a very good article. I know that this is denied by some agriculturists, but I have modified my methods of making; and taking into account all the difficulties which a farmer would meet with under the most unfavorable circumstances, I have come to the conclusion that there are but very few, if any, farmers who cannot make their superphosphates at home upon their own premises. Perhaps now there is not so much necessity for doing it in this Commonwealth as there has been. I believe the action of our legislature has been such that we ought to have a reliable superphosphate. I believe all that are made in this State are examined by Professor Goessmann, at the Agricultural College. Is it not so, Professor Stockbridge?

Prof. STOCKBRIDGE. Yes, sir.

Dr. Nichols. So that it seems to me that in the use of superphosphates, there ought not to be as many failures as previously. In fact, superphosphates, as a whole, are improving. The commercial phosphates found for sale in the stores are better than they were three or four years ago. I have used, in making phosphates, refuse bone obtained from the sugar-refineries, for which I have paid about ten dollars a ton. I have now six or eight tons of that bone at my farm, which I shall use between now and the time that I shall require it on my fields. I find that to be a very cheap source for the procurement of the phosphoric acid element. Sometimes, when the sugar-refiners have a very large quantity of spent bone-dust, they sell it very cheap. I have bought it as low as five or six dollars a ton; and it would be well, perhaps, for farmers who propose to make their own superphosphates to keep an eye in that direction. Sulphuric acid at the present time is very cheap, and with a little experience, the two materials can be handled without injury to the clothing, and all the different processes can be gone through with quite satisfactorily on the premises.

I hope, gentlemen, that the influence of our deliberations here will be to induce farmers to resume the cultivation of Indian corn. I am certain, from a pretty large experience, that it can be produced at less than one-half what it costs us to bring it here from the West. I believe we can raise Indian corn at a cost of about forty cents a bushel. I am told that it has been raised at one-half that sum. I have never quite succeeded in doing that, but there can be no question that Indian corn can be raised upon fair land, with suitable fertilizers, at about forty cents a bushel.

Question. Do you use your bone just as you receive it from the sugar-refinery, or do you pulverize it?

Dr. Nichols. I generally add the acid to it just as I receive it. It may be done either way.

Mr. Hapgood. I think corn can be raised for less than forty cents a bushel, by the use of barn-yard manure.

Adjourned to evening.

Evening Session.

The evening meeting was called to order at seven o'clock. Dr. Wakefield, of Monson, in the chair.

COÖPERATION AMONG FARMERS.

BY HON. PAUL A. CHADBOURNE.

We have had this afternoon, gentlemen of the Board, some very interesting experiments recounted here,—experiments for the purpose of causing an acre of ground to produce more than it had produced under the old methods of cultivation, and I know that those experiments have been very successful. I called upon my friend Stockbridge for his formula, and he did not tell me that I must wait until it came out in the College report, but gave it to me at once! The experiment succeeded admirably. I am satisfied that he is working out successfully that valuable problem of making two blades of grass grow where one grew before. But in all these discussions there is one thing comes home to me: What is the use of all this production? Why are we so anxious to cause these acres of ground to produce so much more than they produced in former years? Evidently, the thing we are all aiming at, is the great problem of living. How are we to make life more pleasant, more desirable, than it has ever yet been, and especially, how are we to make farm-life more desirable? For we are constantly saying, "The young men are running away from the farm; they are turning aside to other pursuits"; and the great thing we have before us is, not only to make our farms productive, but to make them the most attractive places in the world. Now, I propose to address myself this evening to one simple phase of this problem of living,—one of the phases which, I believe, presses itself home upon the attention of the farmers of this broad land.

The problem of living becomes more and more complex as civilization advances and population becomes more compact. Savages, in their low plane of life, can live on the chance products of the earth,—owning all such products in common,

or having the common right of taking them. The pioneer, who is willing to forsake his kind, can find places where he can supply his animal wants with almost as little forethought as the fowls and wild beasts require. An old Jerseyman, whom I found on the western coast of Newfoundland, told me *that* was the best place in the world to live in. "Why," said he, "here is wood for the cutting. A little patch of ground produces all the potatoes and cabbages I want. In the spring, when the herring come in, I can take enough of them to send to Halifax in the fall for all my flour and supplies. In the winter there is plenty of game for eating and to give me a good bit of money for their skins." Another Englishman, who owned a little trading schooner, gave me nearly the same account, and then added, "here we have no taxes to pay," and then he recounted with intense expressions of disgust the taxes which they had to pay in Halifax for roads, for schools and churches! He paid taxes for no such things, and he was content to have none of them. And such men you find all up the coast of Labrador and on our western frontiers, scattered all up and down among the Rocky Mountains,—men who live mainly on the natural products of the earth,—a mode of living impossible when population so increases, as to give the benefits of civilized life. While it is easy for men to live under such conditions, and comparatively easy for men who have fortunes left to them, to start in the world in any business, it behooves the American people to consider the problem how every one of their citizens may secure a home, and secure to himself and his children at once, the advantages of civilized life. We can, any of us, start off and find a home of our own; land is waiting for us. I have spent a good deal of time, where, if I liked a piece of land to live upon, all I had to do was to measure it off and take possession; and it was mine; land rich, surrounded by grand scenery, and abounding in mineral wealth. We can start for such places to-morrow. But who wants to go as a pioneer? To take the chances of the neighbors that may settle near him, shut himself out from the refinements of civilized life, and bring his children up amid the surroundings that may be a curse to them? Especially if he is poor,—has but just means enough to reach his plot of ground, he has the risk of sickness and

want before him, with, perhaps, no one to lend a helping hand. But now suppose twelve or twenty young men should go together, could not they form a community of their own, and carry with them all that is best in New England home-life, and stand by and aid each other, and bring up their children with good examples before them? If I shall seem to you to-night to say some things that belong to a social science gathering, I speak because I have thought much on these things; and while I am anxious to do all in my power to guide men in cultivating the soil, I want this knowledge of agriculture to be subservient to this one idea of increasing *the number of cheerful, pleasant homes in our land.* I do not want agriculture to take such a form that men shall be induced to dwell in cities, nor to look to trade and manufacturing as a means of buying farm products, except when they are compelled to. I want agriculture to take such a form as to call the largest number possible away from these pursuits where too many are now crowding to live lives of dependence with uncertain incomes. I want to see the thousands of little homesteads all over our land, giving to their owners the substantials of life from the soil itself, giving them the means of rational living always, as a reward for industry and homely economy.

This is a time of general complaint in business; and in this disturbed condition, we see the danger that hangs over some great communities, that productions of certain kinds shall be stopped, and whole masses be thrown out of employment,—whole masses that are in the main unprepared for idleness, because they have no reserve of property, and yet live under such conditions that every day demands pay for shelter, food, fuel and raiment. Now, it is not simply a problem for our country to solve that we shall become great producers, but it is that all our people shall have the conditions of living; that property shall be well distributed; or that the largest number possible shall have homes of their own, and the means of plain living, to say the least. Our cheap land has thus far been our safeguard. But we do not want our cheap lands and system of agriculture to lead to great estates. We want, instead, a sub-division of land, so that we shall have the largest possible number of independent homes; yet we want

the advantages that come only through extensive business arrangements. Can we secure these two desirable ends? It is very difficult to do so, but it is worth while to try,—at least to discuss the possible principles of action, so that while we learn how to cultivate an acre to the best advantage, we shall also be learning the best manner in which to make that acre subservient to the life of man, securing for him comfort and independence at the same time. It seems to me, that much can yet be done to draw people from the over-producing forms of industry on the farm. Many of the schemes that have failed, and many now in operation, are worthy of study, as having in them some element of good,—some element that can be woven into a better system yet to be worked out.

There are certain principles of human nature that are so strong and so essential to the full development of the human race, that any system of labor or government that ignores or represses them, must, in the end, fail. It sometimes happens that schemes that have in them much that is good, fail partially or completely, because they are pressed too far; because they ignore principles that are just as essential as those upon which they themselves rest.

1. I take it for granted that any system of coöperation that ignores, or tends to break down the family relation, will fail utterly, or will be confined to small and peculiar communities that can be gathered from the people, and assembled in a particular place. Such a system can never be accepted by any ordinary community; that is, it can never become universal.

2. I also take it for granted that coöperation must be of such a nature that each man, or head of family, shall have a voice in the management of the property concerned, and a return in proportion to his agency in promoting its increase. Any coöperation that ignores the family, or seeks to merge the family in the community, and all profits into a common stock, can never have more than a temporary or limited success.

We make these remarks here, because we know that coöperative schemes have been attempted, and have failed; schemes that had in them many excellent ideas; schemes that, in theory, promised well, failed because they were not

built on the strongest instincts of the race. It may be well to glance at two or three coöperative experiments by way of illustration, and this I propose to do, after considering more fully the general bearing of the question on every-day life, or the principles of coöperation that society has found to be essential to its life, and enforces by civil law or custom.

It is plainly impossible for men to live, and have the benefits of civilized life, without coöperation in some form. The question to be considered in the end by us is, how far voluntary coöperation can be carried to advantage, especially among farmers. We shall attempt to discuss the general principles of coöperation, illustrate the subject by examples of successful coöperation, and point out the possible extent to which this principle can be carried in New England agricultural districts and in new settlements.

The necessity for coöperation is so great, that, as we have intimated, society, as a whole, demands it, and the laws enforce it, not upon any class, but upon the people as a whole. The demands change according to the conditions of the community. All our public roads are examples of coöperation. The law compels every man to do his part in building and maintaining these highways, because they are essential to civilized life; they are such common benefits, that, as all would not voluntarily do their part to secure them, society compels each man to join with his neighbors in the work,—a work essential to progress, essential to the enjoyment and profit of all. Public schools are a second example of enforced coöperation. Such schools are declared to be essential to our civilization, and so society demands that each man shall do his part in sustaining them. In both these instances, the principle of coöperation is carried farther than it could be carried voluntarily in the community at large, until the world is much better than it now is.

The principle enforced in these cases is, that men must contribute according to their property, while all have an equal right to the advantages. The man who pays but a poll-tax has the same right in the public highway and to the public school as the one who pays a hundred times as much. In fact, up to a certain point, society acts upon the communistic principle. We go to the ballot-box and vote away money.

We do not vote away our own money in every case, nor the money of this man or that man; we vote away a certain part of *all the property in the town or State* for the public uses. In our State, the man without a penny may have as potent a voice in taking that money, and in determining its use, as the man who claims a million. We say, in any town, "We want fifty thousand dollars this year to keep good roads for all, good schools for all, and to give food and raiment and shelter to those who cannot obtain them for themselves." We send out a man—the tax-collector—to take so much property wherever he can find it. Up to this point every good citizen is a communist. And it is a fact, that the more civilized a society, the farther does this principle of communism prevail. Witness the advance of public schools, the provision made for the poor and unfortunate. Although the operation of this principle, up to a certain point, is good,—even essential to society in its best forms,—there are only a few in the world who claim that it is possible or desirable for this principle to prevail universally.

But there is also much voluntary coöperation that has in it the element of the communistic principle. In most of our churches the expense is voluntarily borne by comparatively a few. In almost every Christian church the hearer is welcomed, whether able to pay or not. In our colleges, the money given is for the perpetual use of young men or women. Those who pay most, pay but a mere fraction of what is spent for them.

In other cases the benefit, or possible benefit, is as the amount contributed,—as in mutual insurance companies,—a most beneficial form of coöperation.

The growth of all these is understood, and their principles are recognized as wholly beneficial.

As we have remarked, coöperation, under the communistic system, can prevail *wholly* only in limited communities; that is, where some form of intense religious life, or abnormal philanthropic views, are more powerful than the instinct of separate ownership in property. This state of things can never, we believe, control any community, except it be a community drawn together by taking here and there one from the great mass. But from such communities we can learn

much of the possible advantages of voluntary coöperation among those who would divide profits.

It is a dream of some that wages should disappear, and that all should become partners in business. This would be desirable, were it feasible. I should be glad to see the whole community raised to that standard, that working for wages should be confined to the young; that every man should aim to become an owner,—and, at last, become an owner, sole or in part, in business. The thing that now renders this impossible for all,—and, perhaps, always will render it impossible,—is the want of thrift. A home of one's own; a business of one's own, means *laying up money*. So long as men so plan their lives, and so live, that their wages are spent as soon as they are earned, or before, a home and a separate business are impossible. So the escape from the wages system can come only through hard work, economy and wise living. When will the whole community come to that?

The first scheme of coöperative *farming* that I shall mention, was one founded on generous views of human nature, on the supposition that the common farm-laborers of England, if supplied with capital, land and appliances of the best kind, would, at least, be able to supply their own wants, and keep the property good by their united labor. In other words, it was an attempt to see if men who had been accustomed to the wages system could not be brought into a better condition on the principle of coöperation, provided they had every needful advantage supplied to them.

Mr. William Lawson, from 1862 to 1872, at Blennerhasset, in Cumberland County, England, tried the experiment of coöperation by buying and stocking a large farm, going into extensive improvements, buying expensive implements, and providing all the appliances of scientific farming. The defects of the experiments seem to have been,—

1. Leaving the work to incompetent hands. His parliament, in which all had a right to speak and vote on the manner of conducting the business, was a failure. Decisions were made by those ignorant of the work.

2. It was known that there was a deep purse to draw upon, and so individual responsibility for success was in a measure lost.

3. The persons concerned had never planned and made property for themselves. They were in the condition of paid laborers, who must depend upon others to plan and carry on business. And no set of paid laborers that I ever saw will go on a farm and earn their wages for a year, unless they are under the leadership of some master-mind who directs.

4. Mr. Lawson had other hobbies that took up time and attention.

As a result, he found a loss in ten years, on farm and buildings, of over thirty thousand dollars, in farm accounts of over thirty-five thousand dollars,—about sixty-seven thousand dollars in all.

His experiment was founded on a kindly view of human nature. He found the difficulties which meet every reformer, —laziness, viciousness, and incapacity. He found, as every man must find, that business can be carried on successfully only when all employed work to advantage. If you would have coöperation, all must have the ability and will to do their part, or else the willingness to put themselves under the control of competent leaders, as workmen are controlled in the service or wages system. The necessity for such control and direction for the mass of men, is one of the reasons why the wages system prevails so extensively as it does.

The second example of coöperation I shall cite is that of the Mormons in Utah. This is peculiar, as connected with a religious organization. I do not propose to consider at all the peculiarities of the case, but to point out the benefits that have come to that people through coöperation.

Twenty-eight years ago, they came into Salt Lake Valley so poor, that they kept themselves from starvation with roots and berries; but they were so numerous, that they had among them the elements of all industries. They moved under the direction of their leaders, who divided the ground and directed the labor in general. They had a country that must be irrigated, and that system of irrigation binds together every community in that whole territory in a system of coöperation and mutual dependence. Water must be distributed, and the rights of all to it be secured. They are compelled to pay one-tenth of their income to the church. And yet that people have become rich; their accumulations

have been wonderful, if you reckon the public improvements as well as their private property, and private property the church respects and encourages. There is no communistic system. Their coöperation is such as might prevail in any community with different religious beliefs.

Their trade is on the same plan. "*Zion's Coöperative Union*" does the trading for all the Mormons of the Territory. It buys in immense quantities, and distributes to each settlement, and in each settlement just help enough is taken to distribute the goods. There is no waste from useless stores and unemployed clerks. Any one who wishes a part of the profits of this trade, has but to put in his money and draw his proportion. When we see one hundred thousand of the poorest people in the world carried across the wilderness and made comparatively rich in a few years, we see the possibilities of coöperation, and long for a principle of wisdom and wise forethought that shall secure what blind faith and obedience to church officials have here wrought.

The third instance is that of Anaheim, in Los Angeles County, Southern California. For this account I am indebted mainly to Mr. Charles Nordhoff's valuable work on "Communistic Societies."

In 1857, fifty Germans of San Francisco, California, bought, by an agent, Mr. Hansen, eleven hundred and sixty-two acres of land at two dollars an acre.

None of them were farmers; but there were carpenters, blacksmiths, a teacher, a miller, a hatter, merchants, teamsters, etc. They were, with one or two exceptions, poor. They continued to work for wages, and Mr. Hansen cared for the land, improving and planting it by hired labor.

It was divided into fifty twenty-acre lots and fifty village-lots, of one acre each. In three years, the distribution was made to the owners, and by that time each shareholder had paid in twelve hundred dollars. Those who could not raise all the money were helped by the others. The farms were divided by lots, some paying more and some less, according to the appraised value of each estate.

Here was a settlement of fifty families,—coöperation for three years. Then coöperation ceased. Not one failed. In 1872, the property that had cost each of them, on an average,

one thousand and eighty dollars, was worth from five thousand to ten thousand dollars,—say an average of seven thousand five hundred. They had lived well, and had enjoyed all the advantages of society.

They grumbled! And Mr. Hansen said he would rather starve than conduct such another enterprise! I think there are places in New England where such communities would do well.

But the advantages of coöperation may be reached to a much greater extent than they now are. The Granger movement—so far as it secured concert of action among farmers for their work and profit—was a move in the right direction. We have made progress in farming and in farm-life in many respects, but many of the pleasant incidentals of farm-life have passed away.

Poverty made our fathers mutual helpers. And the want of facilities for travel made them apt to seek social enjoyment in the neighborhood. They borrowed and lent. They "changed works," and the young men of one farm hired out with neighbors for haying or hoeing or harvesting, and the daughters went to work in other families where there were sons instead of daughters, and often remained there as wives. The good farmer could not husk his corn without calling together all his neighbors, old and young, to fill his barn with merry laughter and eat the baked beans and pumpkin pies of the good housewife. And she, in turn, must have her "apple-bee," where work and fun and frolic made scenes that we old fellows remember as the poetry of the rough farm-life of forty years ago. There was at that time a vast deal of rustic coöperation that was helpful, and which, best of all, favored social life,—pleasure in the neighborhood,—which none of the parties and calls of fashionable life can compensate for.

Much of all this has passed away, perhaps no more to return, though I hope to see some of it again, as open fireplaces are once more sending up their cheerful blaze for family gatherings, and the old brass candlesticks are once more finding their place on the mantel-piece.

But there are more important matters now in which coöperation might be carried much farther than it is.

1. In the matter of introducing improved machinery. It is not too much to hope that steam-ploughs may yet become of service to us in the West, and in parts of New England. These and other expensive machines might well be owned in common by a community of farmers.

2. Farmers and mechanics might combine to aid each other more efficiently than they now do. We want to see our manufacturing industries distributed as rapidly as possible, to prevent great accumulation of people at single points, and to save transportation of food and stock for manufacturers and manufactured materials to consumers.

3. Coöperation might develop new kinds of industry. I see no reason why the problem of beet-sugar might not be worked out successfully, if twenty good farmers would combine for this purpose. Cheese-factories are a successful illustration of what coöperation can accomplish for profit, and the comfort of the household which is now freed from the labor of cheese-making.

4. Fences. Money enough might be saved among the farmers of New England to nearly pay the farm-taxes of New England, if they would wisely coöperate in this matter of fences. As it is now, every man has to fence around everything he has, to keep cattle *out*, whereas fences should be built only to keep cattle *in*.

These are mere hints as to the lines of coöperation that might be extended to the profit of every community.

In one other respect, there is the greatest improvement to be gained, and that is, in beautifying grounds. If all the farmers in every neighborhood would join in road-making; seeing that all their roadways and roadsides were made pleasant to the eye; that every tree cut, and every one planted, should have reference to the beauty of the place,— the homes in such a neighborhood would soon become beautiful, and if thrown into the market, would bring fifty per cent. more than the same property surrounded by the tokens of neglect. The improvement on every farm helps the neighbor. In some villages this coöperation has wrought wonders. The effects of the Laurel Hill Association, of Stockbridge, and the Fern Cliff, of Lee, are examples of the pleasure and profit drawn from such coöperation. We in Williamstown have

done something in the same direction. When all work together in the same line, and for a given purpose, it is marvellous to see the results.

We want to see every New England town permeated by this spirit of union which aids in the accumulation of property, and in beautifying our homes. It is in accordance with the spirit of farming, which is, to aid others. For what purpose do we have our agricultural exhibitions? For what purpose do we meet, and our Secretary work, but to coöperate with each other, to make known everything we discover to aid our fellows? Let this principle be carried as far as it can possibly be carried, and leave the home and independent business for the head of each family intact.

Every change that promises good-fellowship in neighborhoods, and in the work of life, and, above all, anything that promises to take multitudes from those methods of living that are unstable, and tend to continued poverty, and brings men into modes of living that promise permanent plenty, independence and healthful, happy homes, should receive our careful consideration and hearty God-speed. We do not believe in communism, nor in communities isolated by peculiar religious or social views. We believe in no system that cannot embrace an entire community, with all its peculiar opinions and social theories. We believe in no plan that is not adapted to the people as a whole. The principle of coöperation prevails from necessity up to a certain point. Can it not prevail much farther than it has ever yet done,—saving labor and promoting intercourse and the innocent pleasures of life? If it can, it is worth our while to bring its benefits before the community, and aid those who are willing to do their part to avail themselves of its benefits in our settled New England life, or in those new States that are waiting for thousands of new communities, such as might be formed under wise leadership from the young men of our farming districts, or from the overburdened population of some of our large towns and cities. It is a good thing for us to cause two blades of grass to grow where only one grew before; but the most glorious thing an American citizen can do for his country and his kind, is to cause two happy homes to arise where only one was found before. For the great crop of the world—that toward

which all others are but the means—is a generation of noble men and women, filling and adorning thousands of simple rural homes.

The CHAIRMAN then called upon Hon. MARSHALL P. WILDER to address the meeting.

Col. WILDER. I am called upon so unexpectedly, that it is impossible for me to address you in a satisfactory manner, after a gentleman who is so sound in all his views as President Chadbourne, has addressed you as he has this evening. I cannot refrain, however, from expressing the gratification I feel in seeing so large an audience of the gentlemen who compose the Board, and others who are distinguished in the arts of culture. I have been extremely gratified with President Chadbourne's lecture, and although at first my views did not quite coincide with his (I have not quite understood this principle of coöperation and Grangerism), he has converted me. Now the question is, Where can we find the sinews of war to carry out this principle? I believe it is perfectly sound, physically and morally; but the question is, whether we can find twenty-five or fifty young men in New England to go to Kansas,—and I believe they could not do a better thing,—or to California, where there are unoccupied lands which, if they could be possessed, would almost feed the whole nation. But the point is, as I have said, whether we can get our young men in New England to turn their enterprise in that direction.

Having expressed my views, I think it is the duty of some other gentleman to come to the relief of the assembly.

Mr. FLINT. I was very glad to hear President Chadbourne allude to the results of the labor of the Mormons in Utah. I have visited that Territory two or three times. I spent a few days there this summer, and had been there previously, and it seems to me that, setting aside the question of their peculiar social system, there are many things for our community to learn from the last thirty years of the experience of the Mormons in Utah. They went there, as has been eloquently stated, a poor, oppressed and despised people. They were led over the plains under every possible disadvantage that you can conceive of. They found the country around Salt

Lake a desert. They subjected themselves to hardships of every description, and endured all manner of deprivations for the sake of their faith. If you go there now, you will pass through miles upon miles of a barren, ashen-looking desert, until, having passed through the magnificent Echo and Weber cañons, you are ushered into what you might almost call a garden. It gives one a most delightful sensation, after riding day after day and night after night, over a thousand miles of barren plain, to come into that great Territory, which he knows was once as barren as that over which he had been passing, and find all the fruits of the temperate zone and all our grains growing with the utmost luxuriance, everybody at work, everybody busy, everybody comparatively rich, and everybody apparently happy. I say it is a thing which we ought to set down to their credit, that they have been able to show the practicability of reclaiming what was practically a desert, because the whole Territory was covered with sage-brush and sand. The very spot where Salt Lake City is now located was once a great sage-brush plain, almost a desert, covered with sand. Now, the city is one of the prettiest in the country. The streets are broad and straight, the houses are surrounded by fruit-trees and gardens, in which you will see flowers of every description. I saw there one of the most luxuriant gardens that I have seen this summer, full of every variety of fruit, growing with the utmost perfection. Cherries—I never saw such cherries. Scores of trees, every branch loaded almost to the ground with most magnificent cherries, and among the most luscious I ever tasted. There were gooseberries, currants, raspberries, strawberries, many kinds of fruit, growing in that garden in the utmost profusion. This garden was perhaps a little better located than some others for irrigation; but the whole city is irrigated, and this garden, of course, was cultivated by irrigation; it could not have been done without; but it shows what can be done by coöperation. There was a large body of people, under a central will, which could guide and direct them. There was industry, application, and little loss of time; and there they have built up that large community, under a great many adverse circumstances, until they have become a prosperous and growing community. Of course, I do not refer

to the peculiarities of their social life. I merely allude to it as evidence of the prosperity resulting from coöperation.

I have seen some other examples of the same kind, perhaps not quite so striking, but I am satisfied, that if a small number of New Englanders were intending to locate in the West,—in Iowa, Kansas, Nebraska, Texas, or in California,—the best possible method of doing it would be for ten, twenty or thirty families to combine together, and locate in the same neighborhood. It could easily be done. They could depute one or two of their number to go out and select a suitable location, and in a very short time,—in California, in a wonderfully short time,—they would have a section to themselves very easily tilled, very easily brought under cultivation, and in less than half the time in which it could be accomplished here, they would have a prosperous village of happy homes; and there they could have every facility for education and culture, which they would not be likely to find if they went simply as individuals and independent. I am somewhat familiar with the example which was mentioned in Southern California, Anaheim. It is a perfect success. The whole community has prospered, and will prosper more and more hereafter. It is very difficult for a man in California, who has the right grit in him,—who has application, honesty, and a high-toned purpose,—it is difficult for such a man to fail. Success is sure. The cases of failure are cases which you may attribute almost solely to negligence, to laziness, to inefficiency, or to some want of proper care.

But I simply rose to state that Prof. Stockbridge has given more thought to this particular subject than I have, and I am very sure the audience will be very glad to hear him.

Prof. Stockbridge. I have occupied so much of the time of the Board to-day, that it seems to me that it would be out of character for me now to make any extended remarks. I cannot, however, sit down without expressing the great gratification which I have felt in listening to the lecture of President Chadbourne, and more especially I would express the gratification I have felt at hearing our venerable friend, Marshall P. Wilder, say that he has now become converted to the doctrines of the Grangers.

The Chairman. We have had a very pleasant speech from

the Secretary of the Massachusetts Board. The Secretary of the Board of Agriculture of New Hampshire is present, and I hope we shall hear from him.

Mr. J. O. Adams, of Manchester, N. H. I have nothing to say except this: that however pleasant it may be to talk about twenty-five or fifty intelligent, respectable and sensible young men going from New England to the West or Southwest to make for themselves prosperous and happy homes, I can but look upon the other side, and see with how much regret we should turn our faces to them as they turned their backs upon us. We cannot spare twenty-five men from any of our country towns. We might spare them from the cities, but the men in our cities are the men who will not go, for they have been so long accustomed to live upon the plans of others, that they have lost all self-reliant power, and if they emigrated to the West, they would meet with the same disaster that has been portrayed by President Chadbourne in a certain community. If communities were to be formed of this kind, for the sake of improving the soil, there are places open for their occupation all over New England. If they will come up into our rocky State, I will show them plenty of good land that has been abandoned because the fathers grew old and the sons became discontented and left their homes, the daughters married city merchants or city lawyers, and the homes are left desolate. Many of these farms have gone back to woods, as many ought to go. But if there are people who desire to form a community, they can find, within five miles of a flourishing town, and within one mile of a railway, an abundance of land, that I will guarantee will, with proper cultivation, give them a rich compensation for all the labor that is expended upon it.

It occurred to me this morning, while we were discussing the practicability of growing corn by the use of chemical fertilizers, that perhaps our deserted farms would by and by be reoccupied. It seems to me that one reason why they have been abandoned is because, as I said before, the fathers were growing old, the sons had left, and there were none to till the soil. The growing of corn has been abandoned, in great measure, and we are buying two or three millions of bushels for our little State every year. The growing of wheat

has been abandoned, and we are buying nine-tenths of our flour. And so with a great many other products of our soil. But recently there seems to be an inclination to cultivate these old crops again, and it seems to me that if, by the adoption of the formulas of Prof. Stockbridge, we can make our hills bloom again with luxuriant fields of wheat and rich crops of waving corn, the old times which we now cherish so much in our memories may come back again; for, as was said here, there is nothing more attractive to him who loves a rural life than waving fields of wheat, or the long rows, standing like a marshalled host, of a cornfield.

But I merely rose in order to show that I am ready at all times to manifest my interest in the prosperity of the farmer. I am happy to meet the gentlemen of the Board of Agriculture of Massachusetts. In our Board, we have adopted a different plan in regard to public meetings from yours, and we think that for our State it is better; it might not answer so well here. Your people have been educated to a higher degree of agricultural knowledge than ours. They have had the benefits of a Board of Agriculture for a long series of years. Ours is a new Board, having been in existence but five years; we could not induce our people to give three days to a meeting of this kind, and therefore, instead of holding a three days' meeting in one city or large village, we commence to-morrow to hold three meetings, of one day each, in Rockingham County,—at Hampton, at Kingston, and at Exeter. By so doing, we reach a very much larger number of people, and believe we are doing very much more good than we could in any other way.

Adjourned to Wednesday, at ten o'clock.

SECOND DAY.

WEDNESDAY, December 1, 1875.

The Board was called to order at ten o'clock by Dr. LORING, and Hon. MARSHALL P. WILDER elected Chairman for the day.

Col. WILDER, on taking the chair, said: I am happy to show my face once more among you, although I do not intend

to enter upon any very arduous service, but merely to let you know that I am not delinquent in duty. I thank you for your cordial approval of my taking the chair.

I have now the unfeigned pleasure of introducing to you, as the orator of this occasion, the Rev. Wm. H. H. Murray, —a gentleman who is widely known, not only for his zeal and energy in the culture of the soul, but for his interest in the development and improvement of agriculture, upon which the whole community must depend.

ON THE BREEDING AND MANAGEMENT OF HORSES.

BY REV. WM. H. H. MURRAY.

The subject which you have advertised as the one to be discussed by me at this time, is the "Breeding and Management of Horses." Of the *management* of the horse, I have not the time, neither have I the inclination to-day, to speak; and I presume that among those who are here, there could barely be found five who would agree touching what is the best fashion of management: as every man has his own idea, and every man who owns a horse thinks his own idea is better than his neighbor's, touching the question of his management. I have found no greater divergence of opinion in reference to horse matters, than just this question: How should a colt be managed? In reference to his education, in reference to the discipline of his powers, in reference to his diet, in reference even to the surroundings of his stables, and how he should be managed when driven in those great contests of speed which decide the quality in him, I find few men to agree. So we will lay that aside. I have thought that, in reference to the matter of breeding, there might be some young men here, and if not here, there would be young men in the country before whom this report, when published,—as I understand it will be,—will be laid, who would be interested in knowing what a young man who has been actively engaged in breeding, and who has made his studies touching the literature of the horse tend in that direction, had settled upon in respect to two or three of the dozen points involved in the general problem.

I would say, then, in the first place, that there is but one way to approach this problem of breeding the horse. It is the way in which we should approach the discussion of propagating any form of life that has been made of God, and is intimately connected with human happiness and the welfare of society. The greatest coarseness that can be manifested by a human being is the coarseness manifested in the presence of a woman, and especially in the presence of a woman who is a mother. A man who can derive any element of joke, any material for squibs, or the least substance for irreverential remark, as he looks into the face of the mother as she holds her child in her lap, or on her bosom, has stamped himself so base, so ignoble, and so utterly rude, that he has ruled himself out of the presence of respectable and cleanly thinking men.

Whoever can approach the problem of propagating life so that it may fulfil the high, and I may say, the serene uses that the Creator intended it to fulfil; whoever can look even upon a young lamb in the farm-yard, and not see in its existence one of the divinest mysteries in the universe; whoever can look into a nest of little robins, and see the care of the old birds for their young, and not feel that he is touching the margin of the greatest mystery we have to explore, is a marvel of coarse insensibility,—and going up to the higher forms of life, until we come next to the highest, perhaps, the propagation of the horse,—for I place higher than the propagation of the horse, the propagation of the dog,—when he sees what God intended in his creation, sees what he was designed to be when God created him—for you know that all animal forms existed first in some mood of God; before ever they had structure, they existed in his benevolent designs; they had an eternity of conception, as it were, in him, and they truly have come out of him, as out of his own substance,—whoever, then, comes up to a problem like this: How can we reproduce the horse, in its old original type, and does not feel grave and sober; feel that he has touched one of the gravest matters of studentship, he is,—I will not say what he is, I will say what he is not,—he is not a sensitive and reverential student of divine causes and effects.

Now, young man, if I have arrived at any truth, if I have

arrived at any correct understanding of this matter of breeding the horse, I am quite sure that I owe it, more largely than to any other one thing, to the fact that I took it up reverentially. "A brutish man knoweth not God," said the old Psalmist. He neither knows him in his essential nature, as he is unexpressed, as spirit, nor does he know him as he is expressed in organism and structure. There is a certain fineness of fibre required in the mind to understand these things, which lie so closely to the edge and verge of Deity. If I have arrived at any truth in this matter, I say, I believe I owe it more to the fact that I took the first knowledge that I discovered out of the Bible, and with it was associated in my mind all the traditional reverence, if you please, in which I had been trained touching the Word of God. I remember well how long I floundered about in the mire of discussion and antagonism, and difference of opinion on the part of wise men as they would be called, in reference to this matter, and I remember well, how, one evening, in looking upon the pages of the open Bible, I struck the bottom fact which underlies, as I conceive, the whole subject; and it was in that plain, ordinary sentence, which all of you know, but which few of you, perhaps, have ever felt in its full significance, that "every seed should bring forth after its kind." I said, "Find the highest type to perform the parental act, and you can repeat the typical creation. Find two parents that represent the original idea in any organism or structure, and I can repeat the original idea." Find the typical rose of all the world, and you can repeat the first rose that ever was made. Find the representative daisy, and you can repeat the original daisy form. Find the original perfection of horse structure, horse temperament, horse form, and you have got back face to face with the original idea that was in God's mind before ever he stamped it into the physical structure of the noble animal.

I will pass over the history of the breeding and management of the horse, one of the most unique and wonderful which the literature of the world records, pausing simply to say we are only discovering and learning over again the lost wisdom of the world. The Egyptians, for instance, three thousand years ago, bred five or six different styles of horse,

in order to meet the demands of their festivals and royal entertainments. The highest form of beauty,—the royal form of beauty in horses,—as many of you know, was the horse which had such high action in front that his knees, when brought up in stepping, nearly touched his lower lip, as he marched with his nose curbed in. The royal chariot horses of Egypt had this superabounding high knee action in front, as we admire it in the parade horse of to-day. They not only admired it, but reduced it into one of the facts of their breeding. In other words, the royal horse of the old Egyptians,—the horse which drew the king in his chariot, when his captives followed in chains at the rear,—that horse was, as it were, spring-halted in front; and they bred him so for over a thousand years, a distinct breed, a stock that never intermitted its peculiar royal and kingly characteristics. The gradations of rank, from the Egyptian king down to the soldier in the common cavalry, might have been measured, by one gazing upon their triumphant processions, by looking at the height of the knees of the horse, when brought up, as he was passed in the long review.

I will pass over all these suggestive reminiscences of literature which would make a pleasant evening's entertainment, if we were seated together around a genial fire, and I could dwell upon them; but I must come directly to the heart of this question, and the heart of it, from the commercial point of view, is, that breeding is a failure. I maintain that breeding in New England, or breeding in America, is a failure, commercially considered. I take it that any business whose laws are so little known, and whose workings as to results are so little ascertained, that you cannot figure out your result until you come to it, and then, in five cases out of ten, find the result just what you did not wish, and what you were not striving to have,—I say, a business that is no better known than that, not only is, but must be, a failure. A business that is known in its modes of operation, in its methods, and in its results, is the only business that has in it the chance of success. Weighed in this scale, breeding in this country is a failure. There is not a breeder that I know of to-day who can tell me what he is going to have in the colt that will be foaled on his farm next May; tell me surely, tell me as you

can tell me what interest you will receive on the United States bonds you may have,—so much, ordered by law. But natural results are as strictly under natural laws as commercial or financial results are under the command of statute; and if we could only ascertain the law out of which comes the force that makes the result, we should know just how to repeat the result every time. The trouble in New England with all of us, is, we are superficial students; we are objective students; we look at the colt as an object; we do not look at the colt as a creation, and analyze the causes which underlie that creation. How did he get his color? How did he come by his temperament? Whence did he receive that peculiar conformation of structure? Was it from his immediate parents, or from his remote parents, or is there the original type in that colt,—a new creation, as it were, independent of his parentage? For God, in order to preserve the finest specimens of every race or tribe, occasionally repeats the original type of it.

You have all, no doubt, known children that were so much more brilliant than either father or mother, that you could not say they came out of either father or mother. You have known sons so much more talented and able than father or mother, that they could not be called the children of either father or mother. God intervened for his own wise purposes, and made a new creation in that boy, and the result was a poet, or musician, or orator; a being made of so much finer stuff than ever could be reassured out of the parentage that preceded, that thoughtful men say, God went back to the beginning of the world for that man. Well, men are puzzled in meeting a great horse bred from a dam and sire of no peculiar note; they undertake to account for that wonderful creation, as if he were the result of his sire and his dam. I look at it differently. I give that sire no credit at all, because it is such an exceptional case that it is ruled outside of the law of descent. We cannot afford to trust to it by way of reasoning from it. A result that is so exceptional as to be unsupported by any law, you cannot make the basis of any business, or rule of any studentship. You bring me a fine horse, of so much greater value than sire or dam that you cannot account for that horse on the ground of parentage, and I do not try to account for him in that way. I do not give the sire or dam

any credit for him whatever. I take it as one of those mysteries I cannot fathom. I can mention the names of half a dozen Americans, known in literature and state craft, whose names are familiar to you, whose fathers and mothers, grandfathers and grandmothers, could not, if I may so speak, produce them. They were, as I hold, new creations, magnificent original types of men and women.

Well, from such causes, New England breeding of horse stock is a failure, because it cannot predict what the result of breeding will be. Let us look for a moment to discover, if we can, the cause of this result. My idea is that it is, briefly put, *ignorance*. I think at the core of almost all failures you will find ignorance as the cause. I think at the core of this failure that we are making in breeding you will find lack of knowledge as the real cause. For instance, how rarely you find any practical studentship brought to this matter of breeding! How can you expect an ordinary farmer, who never thought a moment on this matter, who never read a book upon this subject, who never looked upon it even as a matter which he had need to study,—nay, how can you take a man who has never studied anything, who never thought about anything, as students think upon matters,—and by such men the majority of our colts are being bred in New England,—how, I say, can you take such a man, and expect that he will make a success in breeding, when breeding means the finest and most painstaking studentship that we have to engage in to-day? That interrogation answers itself.

So we pass on to the next point, that, in addition to ignorance, lack of means has acted as a cause of failure. Breeding requires money. What right have you to rule this great industry out of the companionship of kindred industries? What right have you to make, as the essential of all success in every other branch of industry, *capital*, and not make *capital* essential to all success in breeding? If a man goes into the dry-goods business, to make a success of it, he must have capital, must he not? If he goes into the onion-raising business, he must have capital, must he not? If he goes into the grocery business, he must have capital, must he not? But here are men taking up this business of breeding with no capital whatever. A dam that is worth fifty dollars, perhaps,

—and if you are a moral man, you would not dare to sell her at that price,—bred to a horse that is not worth fifty cents, with the hope of getting a "Dexter" or a "Goldsmith Maid"! Just such wild dreams as that, I know from correspondence I am receiving from all over New England, are being entertained by young men.

Now, the question is often asked me, "Which marks the colt, the dam or the sire?" The Arabs have a maxim, that "the foal follows the sire." It is fashionable, I see, to laugh at the Arabs. We caught the fashion through the egotism of the English thoroughbred breeders, who dislike to own that their favorites originally sprung from, or could be potentially bettered by, an infusion of Arabian blood, to any extent. It is easy to laugh at the Arabs, to say that their horses are not equal to the modern English thoroughbreds, and all that sort of nonsense, which you see now floating through horse literature; but, friends, I find on the old Egyptian tablets, that are three thousand years of age, the image of the horse that is now called the Kocklani in Arabia, the princeliest of breeds there; the same horse, I say, that you see in Arabia, to-day, you find engraved on Egyptian sculptures more than three thousand years ago; which means, that, for thirty-two hundred years, the laws of breeding have not only been known, but kept; not only were discovered, but have been actually taught and obeyed to the letter. Now, then, a people, whether literate or illiterate, must be wise in horse lore that can trace back along a line of three thousand years of breeding so exact that a strangely-colored hair has never come into the hide of one of their horses; so that a different-shaped nostril, a different curvature of the eyebrow, has never yet been known in that princely breed. When you go among a tribe of men who can look back thirty centuries and not find a distinction in the color of a hair, or in the arch-shape of the eyebrows, I tell you you may sit down at the feet of those men as the wisest teachers in the breeding of the horse the world knows. Therefore, when I find that Arab proverb, "The foal follows the sire," and find that my foals do not always follow the sire, I say I must look deeper into this matter. Those men knew a thousand times more than I do; the knowledge out of which that maxim came is not for me to question; it is for me to

account for it, and I go to work to account for it. My opinion is,—I may change it to-morrow; I would not give a cent for a man who would not change his opinion on horse matters as easily as he turns over in bed at night, but, to-day, I am inclined to swing back to the Arabian principle of breeding, —that the foal always follows the sire.

To account for it, in the first place, the Arabs always select their dams with great care. Now, it may be, that the word "best," as applied to their dams, you do not apply to yours. That is, the dam that you would consider the best, may not be the best in the eye of the Arab breeder. What is the best dam in the eye of the Arab breeder? May it not be the one that will allow its foal to bear the stamp of the horse? I think so. I have two dams on my farm that could not be sold by a religious man for over three hundred dollars, in a matter of trade, and yet three thousand dollars could not buy either of them. Why? Three colts have come out of each, and every colt has looked precisely like its sire; has put its feet, when eating its oats, precisely like its sire; has smelt of the water, and muzzled round it before drinking, precisely like its sire; has done everything like its sire. The dam simply carried it, as a mother holds her baby in her lap, and never marked it at all. Now, may not the old Arabs have such facts in mind? May they not, when they laid down the maxim, "The foal always follows the sire," have had this in mind, that there should be no dam bred to a sire that would interrupt the sire in propagating himself. I know a man that has a mare that has foaled two colts. He bought her for $87. And yet she is invaluable. Why? Because each of the colts that came from her are not only like the sire in a general sense, but they are the sire in miniature. In interior habits of the stable, in the way they move about in the stall, the way they toss their heads, and the way they feed and drink, they are the sire over again.

You may take all my fashionable, high-bred mares out of my stable, if you will leave in their places such mares as that, for you have eliminated for me in doing it, half the difficulty out of the problem of breeding; namely, the difficulty which the temperament, structure and habits of dams bring to the breeder. For instance, I could select an animal that is

perfect,—one I know is perfect,—one that can transmit himself, if he is not bothered and interrupted in doing it, by the dam. I know I can, I say, select such a stallion in New York, in New England, and in six or eight stables in the Middle States; and if I can find a dam that will not trouble that sire in the offspring, I can repeat the sire in every colt. The Arabs may have selected their dams in that way.

Now, then, will you see the possibility of this old Arab maxim being true in our practice? First, select a dam that will simply carry the foal, feeding it with its blood and milk, but not affecting it at all, and then select a horse that has, first, the general excellence you want, then the special excellence, and then the power to transmit both the general and special excellence, and would not the maxim be true, that "the foal follows the sire"?

Vicious ones should never be bred to. Men raise sinners enough; we do not need to imitate them in raising equine imps. It is a crime to breed an ugly dam either to an ugly horse, or a good-natured horse. No mare that bites, leers or kicks can be bred in my stables. There is not money enough in Haverhill to get one of those vicious mares into my stalls. It is not *business* to do it. I am not actuated by any higher motive than the old Yankee wooden-nutmeg sense that is born in us down in Connecticut. It is not *business* to do it; for I know that the colt would kill somebody in the attempt to break him, and the sire would get a reputation for being ugly, when the real cause is in the dam, and the result would be, that "viciousness" would be written in popular characters over my stable.

Observe, also, that the foal partakes of the physical and nervous condition of the sire and the dam, not as they are by nature, but as they are at the time when the foal is conceived. These are rudimental principles; but, gentlemen, they lie at the base of success in breeding. I doubt whether our arbitrary fashion of managing the sire and dam at the time of conception is not one of the prime causes of our failure in breeding, when you are talking about success in the really high and fine sense. I notice that the principles of selection, of favoritism and affinity, God has not left out of the horse structure; I notice that there are some dams that do not take

kindly to some sires; and it is a rule, a rule reverentially obeyed in my head groom's management, that unless nature plainly, by sympathy, affinity and expression, points to the result, the result shall never be obtained by us. I must allude to this in passing, because it is one of those things that, in our minds, account for so much that is mysterious and inexplicable in any other way: it accounts for so much in the propagation of the human species, in the perpetuation of disordered minds, tendencies and appetites, wants and craving, that can be accounted for in no other manner. He whose name is Love never intended that there should be any propagation outside of it. Wherever you find an organization fine enough to follow affinity, there you find an organization that must be jealously and sacredly guarded down at the very root and germ of its propagating connection. The man who thinks of this thing rudely, coarsely, who looks at a horse as merely a brute, merely an animal, devoid of sense, devoid of a fine nerve structure, devoid of fine habits, can never be, in my judgment, a candid student of this subject. An excited nervous condition should be avoided at this delicate period.

A horse should never be treated as a hog is, as most New England breeders treat him. I can go into stable after stable, and find every horse as fat as if God had not made him for activity, but sluggishness. He made him strung with strong, lively, fibrous muscles, not to be covered with layer upon layer of adipose tissue. One of the great sins of breeding in New England has been the overfeeding of the stock horse, from which cause many have died. My judgment is that "Fearnaught" died because he had been kept like a swine, not like a horse. My judgment is that "Taggart's Abdallah" has been in danger of death for three or four years, because, in order to make a horse that did not weigh a thousand pounds tip ten hundred and fifty, Mr. Taggart has kept him hog fat. I instance these, not in invidious comparison, because, where the rule is the same with all, there can be no invidious comparison. I impeach the rule and fashion from bottom to top.

There are two extremes of condition in which you should never breed,—where the horse has little exercise, and is kept fat, and where the horse is drawn fine for some great nervous

feat. Either condition is fatal to breeding. The reason "Ethan Allen" got so many weak-kneed, nervous colts, was because he was kept in a nervous condition by constant trials of speed. The two horses that, by a combination of their qualities, would have given us the perfect horse, in my opinion, were old "George M. Patchen" and "Ethan Allen." In those two horses, you had about all an American could desire in a horse. In one you had size, in the other you had beauty. In both you had speed; in both, a splendid temperament. In one, plenty of bone structure; in the other, the finest bone structure. The intercrossing of their respective descendants would have given us, as I think, pretty nearly the perfect horse. Both were wasted, both were absolutely spilled, as you spill a barrel of liquid when you pull out the tap and let it run out on the cellar floor. No conservatism was exercised, no guard was put around them. "Justin Morgan" was killed, was wasted, just as "George M. Patchen" and "Ethan Allen" were wasted,—the three horses that stand as stock horses ahead of all the horses America has ever known.

Here are the essentials in a stock horse: First, *size*. A stock horse should be sizable,—about 15.2 in height, and 1,050 in weight. I would, as a rule, never breed from a horse that did not weigh 1,000 pounds, or that did not stand 15.2. There are exceptions, of course. There are many horses that are excellent stock horses that do not stand 15.2 One of the best stock horses I have in my stable stands about an inch and a half under that; yet, by proper crossing, I can make a great success at the first cross, but it requires proper crossing to remedy his defect. Let another man manage him; let a man, for instance, buy him, pay a high figure for him, and try to get that money back as quick as he can; take dams of all sizes and all temperaments, and the result would inevitably be failure, as it has been under like conditions with more than half the stock horses of New England. "Tom Jefferson" is under size; "Ethan Allen" is under size: this is the one great defect of his life as a stock horse; "Lambert" is under size. These horses, if properly managed, would have been extraordinary stock horses; but under *no* management, and held by their owners only to make the

most money out of them, instead of bettering, they have rather injured, the average stock of the country. "Lambert," one of the great New England horses, in many respects,—a horse that will almost invariably transmit his outward form and gait,—and both are perfect,—is absolutely being wasted, so far as the perfection of New England breeding goes, by the excessive use made of him, and by the lack of discrimination in the dams chosen for him. The same, to some extent, was true of "Fearnaught"; the same is true of "Taggart's Abdallah"; the same is true of "Tom Jefferson." As stock horses they stand nowhere, compared with where they might have stood, if there had been some other genius besides the money-making genius presiding over their stables.

I briefly enumerate the points to consider. The first great point to be considered, is, *pedigree;* second, *size;* third, *color;* fourth, *health;* fifth, *temperament;* sixth, *speed.* The order in which I breed in my stable, is, first, *beauty.* The American temperament is a beauty-loving temperament. The American eye, more and more, is getting to be an eye that delights in size, in clearness of outlines, in the fulness of those points that make symmetry and beauty. There is, probably, outside of Italy, no country on the globe where, considering the roughness of our surroundings at the start, the artistic element has been more profoundly developed, than it is among us. A beautiful horse will always find a buyer. Therefore, breed for beauty. I say to you, that, in my judgment, talking as a breeder with money in view, no horse that is bred should be bred purely for speed. Taken as a whole, breeding for speed does not pay. Twenty years ago, a horse might have had a head like a tub, a gait like a camel, and yet could be sold at a large price, because he had *go* to him. He might be vicious, a cameleopard in style, and a mule in gait; yet, if he would *go*, that was all the American asked. We have left that period behind us. It is the period through which all youth pass,—the period of push and go, hurry and hurrah,—and all nations, like boys, pass through it. But, by and by, there comes to the boy a time when he begins to look at the fineness of things, and delights in them because they are fine, until at last he comes to rejoice in beauty for its own sake; and we in America have come to

that time when the fineness of things appears charming to us, when the beauty of loveliness is being apprehended and craved. The first thing, therefore, for which I breed, is *beauty*. I can always get five hundred dollars for a colt that has a beautiful color, a beautiful neck, beautiful limbs, and a beautiful carriage. The second thing I breed for is *docility*. The third thing is *speed*. *Beauty*, first; *docility*, next; *speed*, last. If I can get the first two in a large degree, and the third in a fair degree, I know I can make a sale, and I know I can get my money back, and get it back early, too, which is a great point with a breeder. If I have a speedy colt, on the other hand, I have to keep him until he is developed, and then I have to put him into a gambler's hands, perhaps, to get my money back. I must wait two, three or five years; and one of the secrets of making money in breeding, as in other business, is in getting rid of things. Some of you have found that out, I guess!

In regard to this matter of crossing, many ask, "Is thoroughbred running stock necessary for a cross, in order to get beauty and docility?" Well, friends, there is a popular error touching this matter of beauty in thoroughbred running stock. Thoroughbreds are not all beautiful. Take "Messenger." He was a great 16½-hand, round-shouldered, big-necked, coarse-headed, thick-legged horse. That was your imported "Messenger"! His son "Mambrino" was a thick-necked, strong-legged horse. His son "Abdallah" had a head as big as a small flour-barrel; was a dirty roan as to color, with a rat's tail, which he stuck straight out! That was "Abdallah." The tremendous ugliness of some of our Abdallah and Hambletonian stock is accounted for by the fact that they have come through "Abdallah," "Mambrino," and imported "Messenger." The idea that the English thoroughbred and the American thoroughbred have always small limbs, small feet, a fine head, and small, arched neck, clean-cut jowls, and a coat like satin, is a fallacy. While these things are the law, there are noted exceptions. I have stood and looked at thirty brood mares, in the veins of many of which not a taint of low blood ran, and I give you my opinion, as an eye-witness of their merits, and rejoicing in their merits, that I could have gone into Vermont, twenty

years ago, and selected, easily, twenty daughters of the old Green Mountain Morgan horse, that, at any agricultural fair in the country, where horsemen were the judges, would have taken the palm for beauty from any twenty out of that collection of thirty mares. Many of them were quite coarse-looking; some of them had hair on the fetlocks, much to my astonishment,—so much so, that I questioned the breeding, until it was clearly proved; many had rather heavy jowls. There were many things about form and motion that did not affect one pleasantly, as I stood and ranged my eye over them, for the ideal horse as to beauty. I do not think that we need go to the thoroughbred running stock for beauty, if we will be careful of our selections among our own breeders. "Tom Jefferson," "Lambert," "Taggart's Abdallah," are as handsome horses as I have ever seen in the thoroughbred family. I am not saying anything about the imagined beauty that the artist loves,—that beauty that you have hung in pictures upon your walls, but never see anywhere else, but the beauty of shapeliness of limb and fairness of look in the stable and in public,—the beauty of the actual, not the ideal, horse. The sheen of the coat, for instance, is supposed to be peculiar to thoroughbreds. It is not so. The horses I have just mentioned have a gloss as fine, a tinting as brilliant, and a glow as deep, when led into the sunshine from their stables, as any thoroughbred I have ever seen; and I do not hesitate to say, that, for beauty, we have in New England as handsome horses in all respects, save one, as are to be found on the face of the earth. I said, with one exception. There is one thing our horses lack. It is that style and kingliness of curvature, that sort of curled look and appearance which a horse can put on in public, which is associated only with a horse that stands 15.3 in height. Most of our handsome horses are too small to be imposing in their beauty. You must have a horse stand about 15.3, if you are to get the finest expression of horse beauty, in my judgment; you must have him measure about such a length from his ears to the sweep of his tail; you must have him stand in the pasture with a certain look of height, breadth and length, in order to have him perfectly fill your eye. To obtain some of these minor points, if you

please to call them so, we should do well to cross with the racing thoroughbred. And for docility and gentleness of behavior until the moment of supreme action comes, we have nothing that equals a first-class thoroughbred of the running family. Take "Joe Daniels," for instance. A child can lead him up and down before the judges' stand. He seems to be conscious of a latent power that he can exert at any moment, and does not choose to exercise until the proper time comes. I have seen a thoroughbred led out, with no defiance in his eye, no glory in his appearance, none of that fire and thunder which we associate with fine breeding and a first-class horse; but when the saddle was put upon him, the rider mounted, and the exercise had warmed him so that the moisture began to start, then see how the veins begin to swell; how the jockey begins to feel the play of the muscles under the saddle as the latent power begins to reveal itself; see how the nostrils begin to show their lining of fiery red, and then—how that horse begins to go! And the farther he goes, the faster he goes, and the harder he pulls.

I have ridden the magnificent creature to which I have referred under the saddle. She would take the first four miles as every respectable man ought to take a horse the first four miles, easily, merely jogging; but when she had reached that point, fixed by good judgment and her own good sense, I could feel her muscles begin to work under me, and she would begin to move up on the bit and settle herself to her gait, and the faster she went, the better she felt. I could feel the swell of the great muscles under the saddle as she gathered nervously for her leaps; her neck would stretch out and become lowered more to the line of her body; her nostrils open and expand at every jump; her ears would come back closer and closer to her neck, like those of a cat when vexed, and then how she would spin! But when she had spun her spin out, she would amble back to her stall so gently, that were it not for the unquiet mouth and the lingering fire in the eye, you would not suspect that she had such lightning in her.

I will detain you only to speak upon one other point. The question has been asked me, and I will answer it, "What makes a horse trot?" Well, it is not the whip,—that is one

thing settled; and it is not your driving, friend, either, which makes your horse trot,—that is settled. I wish there could a fashion come up among us men who drive trotters of driving without reins, until we know more than we do, or until we will admit that we do not know much. A horse cannot talk, and it is very difficult to understand the nature of any being that cannot express its meaning in speech to you. Should you come across a species of human beings that had never uttered a word, and you wanted to master the secrets of their being, how would you begin to master them? What is just the right pull to make on a horse's mouth to save him when he breaks? When is the proper instant to move that bit in his mouth? What is the right way to handle a horse to get him through the air a second faster to the mile? You cannot, all of you, find out these secrets, friends. A few gifted ones who have the prophetic instinct that can see into the horse nature, like Charley Green, Dan Mace, Budd Doble and the Elder Woodruff,—in many respects better than either, in my judgment,—a few men like those instinctively sense it; but we ignorant and bungling chaps better let it alone. That is my judgment. My maxim in driving, young man, is, let the horse alone. I presume I do not take the reins in both hands once in three months, so far as need of strength goes, when I am driving on the road. Of course there are some horses that we must *make* trot, if they ever trot at all; I, for one, do not desire to have anything to do with that sort of horses. But give me a horse that is a natural trotter, and I am sure he will never go except in a trot, unless by reason of some pain in his foot or somewhere else, that may cause him to break. In that case the best way is to let him alone. I am driving a five-year-old colt that is fast. If he breaks, I let him run. After he has been running six or eight rods, I hint to him that it is just as fashionable for him to strike his trot, and if he does not take that hint in a little while, I give him another. But I don't yank him, or jerk him, "pull him back," "settle him down," "square him," as they say, and all those other excellent phrases that do not mean anything. The colt means to trot, and I know it; and if for some unaccountable cause he breaks, I know the habit naturally implanted in him will get him back to his trot

just as quick as he can. A horse cannot run awhile and catch himself suddenly without hurting himself, so he will take another jump or two. When he has jumped two or three times, I give a little touch to the reins, suggesting to him that he may as well trot. He generally knows what I mean; but if he don't, I tell him again, and pretty soon I find him going along with his tail as straight as a spirit-level. I never on such a horse use a check-rein, never put on martingales; but let him go, head up and tail streaming. These are the rudders intended to keep the horse true in his gait, and you have no right to deprive him of his steering apparatus. So, gentlemen, the rule is, that the horse, if he is a sensible, level-headed horse, knows a great deal more than you do about trotting, and you should let him have his own way. That is my best advice, briefly put, in regard to driving.

Col. Wilder. I have no doubt that you have all been highly interested in the frank, ingenious, philosophical and instructive address which you have had from Mr. Murray, in regard to one of the most important departments of farm husbandry, and one which contributes so largely to the despatch of business, to the comfort and welfare of mankind, and the progress of civilization. What is your pleasure, gentlemen?

Rev. Mr. Lyford, of Haverhill, was called upon, but excused himself from speaking, and called upon Dr. Loring, who rose to speak upon the floor, but was interrupted by the Chairman, who said, "Doctor, will you approach the rostrum? You are not accustomed to stand elsewhere, and this is the appropriate place for you."

Dr. Loring. If I had not known Mr. Lyford as a good judge of horses, and had entire confidence in his ability to judge of what I was going to say, and felt perfectly sure he would indorse it, I would not have been called out by him in the way I have, and responded. But he and I have met on the same field before, in Vermont, and we know all about it; and I know that what he knows, I know, and what I know, he knows; so that I speak for him just exactly as he would have spoken for me, if he had a little less modesty and a little more confidence in his own superior wisdom. But he was ingenious, and I suppose he thought he knew where he could

go to select a speaker for himself. He is a good judge of men, and, I assure you, he is just as good a judge of horses; so that he and I stand exactly on the same platform on those two points.

Now, I am going to make, to a certain extent, Mr. Lyford's speech. He and I are Americans, and we believe in a good, old-fashioned, square-gaited, straight-driving, marching American horse that will take the road and go on about his business, and know as well what he has to do as his driver does; which will begin in the morning bravely, and end bravely at night; that wonderful structure which we have here in New England, the outgrowth, not of one breed of horses or another, but the result of the peculiar institutions of this country, which require that a horse should discharge his duty here faithfully and well, not waste it by cantering for a morning's drive, not scampering over a field like a greyhound, or like a coward running away from danger, but holding himself firm and level in every crisis, doing his duty well at the plough and well on the road. That horse has grown out of this uniform social level here, which renders it necessary that the man who is going to meeting to hear Mr. Murray preach should get there as quickly as possible, and, after Mr. Murray has got through, should get home and look after his domestic affairs as quickly as possible; a horse that can carry you about and maintain his equilibrium and his force, and discharge his duty well, not for one man or another, not for the jockey on the track, alone, but for the business-man in his business, for the doctor on the road visiting his patients, for the farmer, when he is desirous of doing good work in his field, for the man who goes out for an afternoon drive, and for the gentleman who does not want to be passed on the road.

This is the American horse,—the best horse in the world; there is no doubt about it at all. Not, as I say, the product of any one given breed, but the natural product of generations of intelligent driving, and driving done with that wonderful skill which the American driver has, and which has not been equalled by any other nationality on the earth; by that assumption of our drivers here, that in order to make a horse work well, you must become a part of that horse, and he a part of you; that between his bit and your hand there must be a cer-

tain sort of magnetic force running, which he recognizes just as quickly as you do, and which will keep him about his business exactly in accordance with the wants of his driver.

Now, I say, this horse, which has grown up here, and which you find everywhere in New England, alike in Vermont and New Hampshire, in Maine and Massachusetts,—the American horse of all work,—has been produced here until he has all the spirit of American institutions. He has inherited a certain sort of common-sense, and knows what he is about. You can harness him when he is a yearling, and he will behave pretty well. He has not only inherited the form which makes him a good-shaped horse, but he has also inherited this moral sense, so to speak, which makes him a good horse, so that you can harness him and set him at work upon his inherited instincts almost. He is superior to a thoroughbred, because he has been born to a business life. He is a good business-horse, superior to all others, because he has inherited from his father and mother a capacity to draw at the plough, and knows what the plough is; to pull on the wagon, and knows what the wagon is; and when the harness is put upon him, he feels as much at home in that harness as the American boy does when he puts on his first pair of pantaloons; and this horse knows this as much better than the thoroughbred does, as this American boy starting out for school knows and feels his duty and responsibility better than does the son of an Indian. He has inherited all those qualities which are useful and valuable in every-day life. I draw that distinction because you do not find these qualities in a thoroughbred horse. The most impatient, wild, unreasonable, stilted, daisy-cutting animal in the world is the English thoroughbred. I should as soon expect to get a good house-dog from a family of wolves, as a good, substantial family horse from a family of thoroughbreds. This thing has not yet been done, because the business of a thoroughbred is to contend, and not to submit. There is no patience in him. His ancestors had none, and he has none. The whole business of life with horses known as thoroughbred is to be brought up to the stand by twice as many boys as there are horses, held firmly by the head, while they are rushing and kicking and struggling so that the riders can hardly keep their seats, until the word is given, when off they go,

helter-skelter, pell-mell, winning with a sudden dash, the result, rather of strength, than skill. Now, in all this there is no exercise of deliberation, or of that self-poise which a thoroughly good business-horse requires. And yet it is what the English thoroughbred horse has inherited; in addition, good looks and good color and a good coat, the three prominent points upon which his advocates dwell most eloquently.

Now, let us examine the horse which we possess in this country. Where did we get him? Mr. Murray has told you where. That American horse, for instance, known as "Justin Morgan," was the ancestor of one of the finest families of horses ever known in the world. He transmitted his own qualities, which mixed well with the dam's, and created a family of horses, native to the State of Vermont, which was almost unequalled. I do not know as I should like one to-day, as their speed was hardly up to modern requirements. They could travel about eight or nine miles an hour, in a style which cheered the driver and charmed the beholder. There was a good deal of fine finish about this horse, and he was really a good horse; he had not speed enough; he was a little tied-up in his gait, had not quite knee action enough, did not send himself as he ought to; but still he was a good horse, and in all matters of hard work almost unequalled. So remarkable was he in this respect, that, when the proprietors of the great stage route, running from Washington west, were in search of teams of the best horses that could possibly be found, they purchased them in Vermont of the Morgan family, horses standing fifteen hands high, and weighing about a thousand pounds apiece; and those medium-sized Vermont horses wore out more than ten times their number of the ordinary long-legged, sixteen hand Pennsylvania horses that had been used for years on that line. They were solid, compact, wiry, short-legged, hardy little animals, did their work well, were good for the stage-coach, good for all service in those early years when our fathers required endurance, rather than speed. But when you rise into a higher range of horses, and demand more speed and propelling power, then you turn to another family, the Messenger horse, not perfectly distinguished in variety to-day, I grant, but a most untiring, invaluable and swift-moving horse on the road. There has hardly been any

such piece of animal machinery as was made up by the old "Messenger" horse of Maine, lying at the foundation as he does of a certain power on the road and on the track that has not yet been excelled. Those two families of horses, the "Justin Morgan" and the "Messenger," really lie at the foundation of our best breeds here.

Now, there is another strain of blood which comes in to make up what I call the perfect American horse, which some of you may be surprised at. Everybody, you are aware, looks upon a French horse with great contempt. With most of us on the road, a French horse is very much like what Cæsar says of the Gauls, who were the Frenchmen of his day, that they began a fight more than men, and ended it weaker than women; and so, as I say, we all dislike a French horse. But here is a remarkable fact. Wherever "Justin Morgan," with his tied-up gait, succeeded in getting a trotter, he had a mare with French blood for the dam; and in that way secured that free action, that open gait, that measured stride, that enabled him to do his work. Now, the imported "Messenger" horse was used chiefly for breeding purposes in the northern latitudes of the United States. The "Mambrino" horse went South, and he, on the southern mares, got runners; the "Messenger" horse, that remained North, and mingled his blood with the French brood-mares, got trotters; and that is the difference. And wherever you find a strain of blood that has speed in it, you will find there a French infusion. That is where this great "Unknown," that you hear so much about, comes from. If you take the pedigree of the best trotting horses, you will find it, "sire, so-and-so; dam, unknown;" and that unknown dam has a little infusion of that French blood in her, that sends stock of the trotting horse along when he breeds upon her. It is a most curious and remarkable fact. The famous trotting horse, "Pilot," one of the most tremendous horses ever raised in Kentucky, was out of a French mare; "Cassius M. Clay's" dam was a French mare. In that way, and that way alone, can you account for the roundness of "Cassius Clay's" ankles, for that roughness of his legs, for that peculiar thickness of his jowls. These peculiarities are due to his French dam, from whom the whole family derived their speed; and from whom, also, I am

sorry to say, came that cold blood, that made so many of "Clay's" colts failures on the track. They were faint-hearted, because they had a little too much of this French blood in them. They have secured the speed, but it took another cross of the "Cassius Clay" blood upon a more hardy animal to make a good, lasting, enduring, powerful trotter.

In support of this view, you will find the best trotters all along the northern sections of our country. You do not go to Pennsylvania to find trotting horses. You go to Maine, New Hampshire, Vermont and the northern part of New York; and Michigan to-day is busily engaged in breeding some of the best trotters we have. We have learned that along the northern latitudes, where the French blood is creeping in more or less, we are pretty sure to get our trotting horses.

I have been speaking about a horse of a superior description, that brilliant animal which has just as much activity as it is possible for a well-organized animal to have. That such a horse can be produced here systematically, I have no more doubt than I have that the thoroughbred can be systematically produced in England. I will agree that you cannot "gather grapes from thorns, nor figs from thistles." I will go as far as that; but beyond that, I am not willing to go. I do not want to accept the idea that man has no power over the animal kingdom, which he undertakes to improve by cultivation. I think he has, and that if we will trace the failures of breeders to their legitimate source, we shall find that it is because the breeders themselves have violated the best laws of breeding. I think we can raise these horses with perfect success here, that we do raise them continually, and that they form a part of the most profitable branches of agriculture known. I have in the course of my life paid to farmers in Maine and New Hampshire, for four or five year old colts (and not paid extravagantly, either), enough to have purchased a desirable farm. And those prizes were not accidents, but they were secured because those breeders had sense enough to know that they could breed a good horse just as well as they could a poor one. And so we can. All those moral qualities, of fine, substantial, quiet, cool nerve, that level-headedness which makes a good trotting horse, that power of endurance which makes a horse lasting on the road, can all be bred; and, more

than that, that amiability of temper, without which a horse is the meanest beast known on earth. I agree with Mr. Murray, that a kicking, ill-natured mare ought never to be used in breeding. That is perfectly true. You do not want to transmit any such disposition. But that we have established right principles of breeding here, and can maintain them, I have not the slightest doubt in the world; and I think if you would go to Mr. Murray's stable, you would find that he himself is applying exactly those rules which I have designated to the production of a good, level-going, square-gaited, sound, sensible American horse. I should not agree with him entirely, that he is going to beat the world driving his colt as he says he does. I know, if he has a colt that will do what he says he will, with that kind of driving, it is because he put into the business of raising the colt what most of us have to put into the business of driving; viz., wisdom and good judgment. I have no doubt that horses are injured by pulling, and are so disturbed by it that they lose seconds of speed, whereas, if they could with advantage be left more to themselves, they would do better, which suggests that, to a certain extent, we should let the horse alone, and not trouble him, if you would bring him to the height of his speed. The qualities of which Mr. Murray speaks as so valuable in a horse, are really the result of wise and judicious breeding, and if you have these qualities you may drive as he does. This amiable and sagacious animal is the American horse, and this is the point at which he and I were aiming in the realm of horses when we united in the authorship of "The Perfect Horse"; probably, you will allow me to say, the best book on the horse ever written!

And now, in conclusion, I have told you what are the qualities of the American horse, and how we can produce them; now I propose to come to the commercial value of the horse, as a part of the general product of the farm, and entering into the trade of the world as do cattle and sheep and swine; because that, after all, is the solid business of the whole matter. You may breed, if you have good fortune, a few horses that are worth six hundred, seven hundred or a thousand dollars apiece for home consumption; but where are the horse-raisers, growers and breeders of this country to find

their general markets for the average product? How can they so produce horses on their farms as to encourage themselves to go into it as a branch of business? I have a very interesting letter here, which illustrates, not only the Englishman's keen eye for trade, but the Englishman's knowledge of how trade is to be conducted, and that wonderful grasp of the English mind which in all matters of commerce never loses sight of the best opportunity. This letter will indicate what ought to be the idea of the cultivation of the horse in the great horse-producing sections of our country :—

"London, 13 November, 1875.

"Sir:— . . . I have taken the liberty of forwarding to you a printed programme of a scheme (the importation of horses into England) I have been elaborating, together with my friends here, who are old established and well-known steamship agents of the highest respectability. My object in writing is to procure the candid opinion of yourself on this matter. The scheme has already been attempted on a small scale, and utterly failed. A company was formed and started with slender capital. They chartered and sent a six-hundred-ton steamer, ill-adapted for carrying stock, to Galveston, where their manager bought the first animals that came to hand, some of them proving to be mares in foal. Such as reached Liverpool, however, though in a wretched condition, realized very good prices. At Galveston, the vessel could not cross the bar, and the stock had to be brought off in a schooner, many of the animals first on board having been ten days with only a very little water, and a starvation allowance of hay. The vessel then went round to Norfolk to coal,—a voyage which occupied some twenty-two days. On being coaled, and having sent ashore the worst of the stock, she started for Liverpool, which, after continuous rough weather, she reached in six weeks. The vessel is essentially a wet one, and I am informed that some of the animals, though between decks, had to have their heads tied up to prevent drowning. The owners of the vessel made a forced sale at Liverpool, and many of the sadly-abused animals, bought originally for £5 to £7 per head, realized over £20, and one £30. We, you will observe, propose starting very differently. With the experience of the Crimean,

Persian, and China wars, and with that of the steady Australian and Indian and Persian Gulf and Bombay horse-traders, we know that horses can be carried safely and without loss of condition at sea.

"From India we took the 10th Hussars and the 12th Lancers to the Crimea, with six hundred and eighty sabres, and their horses landed in splendid condition. The 14th Dragoons, Poona Horse, Scinde Horse, and my own regiment, the Southern Mahratta Horse, went from Bombay to Bushire, at the head of the Persian Gulf, in sailing-vessels,—a six weeks' voyage,—and landed without hardly any loss; saddled upon the beach, under the guns of the squadron, and went immediately into action. We must have numbered about two thousand horses, exclusive of artillery horses. The same was done in Abyssinia, and can and will be done again. I have allowed for twenty-five grooms, exclusive of the crews, for the sole purpose of looking after the horses at sea. It is upon the subject of the horses of America, and the price we should have to pay for big, powerful, well-bred animals, suited for our purposes; viz., carriage, light van, riding, cavalry and artillery, that I desire knowledge. We are now paying £42 for our cavalry animals (colts), and £50 is a very common price for a common cab-horse. From letters I have received from America, I have in my own mind no doubt that the trade can be carried out on a vast scale, very much to the benefit of both countries. Here the demand is great, and, with your 7,145,270 horses, the drain to this side should not, as is anticipated by certain carpers here, increase the first cost of the animals, so as to drive us from the market. We propose, at first, confining ourselves to the Northern and Western States, only going to New Orleans and Galveston when driven there by prices being raised on us.

" . . . An extensive breeder in Illinois writes: 'Good, sound horses can be had, of from fifteen to fifteen and a half hands, at from £15 to £20, and from fifteen and a half to sixteen and a half hands, from £18 to £25.' He considers my estimate of £5 expenses to Norfolk should be reduced to £2. You will probably be against my proposition of breeding our most powerful thoroughbreds, with good, fair, square-trotting action, to your mares; but it must be remembered that we have

to suit the English taste. I know of some travelling sires, boasting the best blood in the world, who can manufacture stock 'after their kind,' which would work wonders with your best mares. I should like to see 'Vanderdecken,' 'Make Haste,' 'Knight of the Garter,' and others, mated with such mares as 'Lulu,' and their produce offered at Tattersall's. . . .

"Your obedient servant,

"W. A. KERR,

"Captain, and formerly Commandant Southern Mahratta Horse.

"Hon. GEO. B. LORING, Salem, Mass."

I have read this letter to show that there is a new market to be opened, and that the American horse is to enter into the commerce of the world. Good, strong American horses are coming into demand everywhere, and the English are looking to this country for their horses. We can, then, step forward, if we will, and enter into the commerce of the world, and supply England with her best cavalry and best driving horses. I read that simply as a tribute from an English breeder, and a man who knows something of what we are doing here. Your Morgans, and Messengers, and Hambletonians, and Patchens, and Morrills, are unequalled for general use, and the best experts throughout the world know it; and I am of opinion that nowhere in the United Kingdom can a supply of horses for all work be purchased with so much ease as they can be in many parts of the United States.

Now, gentlemen, this is my opinion about the horse. I have bred my own horses, and drive them, and like them; and I think it is in our power to raise what we want, if we will exercise good judgment, and that we are not compelled to rely upon accident or chance to reach a satisfactory conclusion. We have it in our own hands.

Adjourned to two o'clock.

Afternoon Session.

The Board was called to order at two o'clock. Mr. Baker, of Marshfield, in the chair.

BOWLDER ROCKS: THEIR PROBABLE ORIGIN AND HISTORY, AND THEIR USE IN THE CONSTRUCTION OF DWELLINGS.

BY DR. JAMES R. NICHOLS.

Gentlemen:—I wish to say a word in a preliminary way regarding this lecture. I have to speak to you this afternoon under disadvantages which, I fear, will render the service unsatisfactory to you and to myself. I have not fully recovered from recent indisposition, and I have not been able to give the subject that careful consideration which one involving scientific statements and facts demands; and also, I have been prevented from writing out the lecture, as it was my intention to do. Therefore, the hour must be spent in a familiar "talk" (for I can call it nothing else) upon bowlder rocks, their probable origin and history, and their use in the construction of dwellings.

I have selected this subject because I am certain there exists among husbandmen a desire to know something of the history and nature of the rocky masses with which they are brought daily and hourly in contact in the cultivation of their fields; and further, I desire to call attention to the desirability of using the bowlder rocks in the construction of buildings in the place of wood, which has been almost universally used in all parts of the country ever since its first settlement.

Now, in relation to the origin of rocks, a consideration of this subject, of course, carries us back to a very remote period of time. It is sufficient for me to say, that rocks, like other inorganic substances upon our planet, have been at some time in their history in a volatilized condition. In fact, we may say that every rock and every mineral substance upon our earth has existed in the form of vapor; and I think we may go still further, and say of rocks and all elementary substances, that they have once existed in still more

attenuated forms; for the new laws discovered by chemists recently as regards the doctrine of dissociation of bodies by heat, leads to the belief that these rocks have been evolved from some common primal matter, which pervades the whole vast universe, and of the nature of which we have no knowledge. It is singular that this view approximates those held by Lavoisier, the father of chemistry, nearly a century ago. This most sagacious philosopher and experimenter stated that it was possible that all matter might be resolved into only three forms,—oxygen, hydrogen and nitrogen; and, certainly, I find the idea of great simplicity in the constitution of matter is gaining ground among modern chemists every day. The results of spectrum analysis go to prove the correctness of this view. And here, let me say, that quite all we know of celestial chemistry results from researches made with that marvellous instrument, the spectroscope. We find from its revelations, that, in the chromosphere of the sun, there exist materials like those which exist upon our planet. But, in addition to the iron, calcium, magnesium, and a dozen other elements in the sun, we find there is another shown in the spectrum which is not recognized as belonging to any of the terrestrial elements. This is shown by a green line in the spectrum. When the spectroscope is directed to the fixed stars, we get some very interesting results; and the same may be said in regard to the nebulæ. It appears that the nebulous matter which is floating through space, is made up of only two elementary forms of matter, and those the most attenuated,—nitrogen and hydrogen. Now, if it is true that these nebulous masses which are floating in the interstellar spaces are the first beginnings of worlds, a difficulty presents itself, unless the large number of our terrestrial elements are capable of being evolved from the two or more revealed to us. A world, according to our notions, could not be perfect unless it held our sixty-five elements. If we apply the spectroscope to the fixed stars of different colors,—the white, the yellow, and the red,—we there find the history of worlds in their formative stage revealed in a most remarkable manner. The spectroscope applied to the light which comes from the dog-star, Sirius, which is a white star, proves that all elementary forms of matter existing there are the most attenuated. We

find hydrogen predominating, and there are traces afforded of thirteen of the other elements known to us. Now, we want to carry our observations a little further, and apply the spectroscope to the rays which come from Aldebaran, one of the yellow stars. In this star there exists a considerable amount of hydrogen, but we also find that the forms of matter have undergone a striking modification, and the number of metallic elements is largely increased. An advance is made in the stupendous progress which is to end in the formation of a world. If we carry the investigation another stage, and apply the spectroscope to the light of the red stars, still further progress is observable. We find an entire absence of hydrogen, nitrogen, and all those attenuated forms of matter in red stars and the metalloids appear, and also their compounds. It would appear that by a process of celestial chemistry, the complex is evolved from the simple forms of matter. First, the nebulæ, which is matter in a state of extreme attenuation; then the white stars, which have progressed a single stage, and are the hottest; then the yellow stars, which are cooler and more progressed; and, finally, the red stars, which are the coolest, and approximate nearer to the condition of our planet, than any of the others. I present these views very briefly, that you may obtain some idea of how, by successive steps, from matter in gaseous condition, under the influence of heat, solid bodies like rocks result from loss of temperature and condensation.

Bowlder rocks are but the representatives of the mountain-rock masses; and let me here define what is meant by "bowlder rocks." The term used to be applied to that class of stones which are found in running streams and in the beds of rivers, rounded and polished by attrition; but it is more proper to apply the term to all rocks which are resting upon our farms "out of position," no matter what may be the form or size. Almost every farm in New England has more or less of these bowlders, these detached masses of rock, torn from their beds, and resting out of their places. Over large tracts of country, where there are no bed rocks, no ledges or quarries, bowlder rocks are thickly strewn, and they are of various kinds, colors and forms, hardly any two masses being alike.

Now, the question arises, From whence came these rocks,

and what is their history? Chemical examination discloses the fact that all rocks are remarkably simple in their composition, and, in fact, simplicity is stamped upon everything in the air, the waters, and the solid framework of our planet.

Half of the earth's crust is formed of one single element, and a quarter of the remaining half is formed of one other element. There appears to our superficial observation great complexity in rocks as regards nature and composition, but in this we are mistaken. There are three distinct kinds of granite, but they are formed by holding in excess some one single ingredient. But I cannot dwell upon the chemistry of rocks.

To return, we find, as I have said, these bowlders upon our farms, and we are forced to conclude that they belong to a class of rocks not indigenous to our localities; and hence a natural desire is awakened to know something of their probable history.

In some sections, intelligent farmers have traced bowlder rocks long distances, and found *in situ* the bed-rock from which they were taken. Geologists have often done this, and proved the identity of specimens transported many miles.

We must admit, I think, that these loose rocks found upon our farms have been left in their present positions by some transporting agency exerting great force. They are a long way from home; they are strangers in our fields. How came they there? In the view of some farmers, they must have come from *above*,—rained down from the spaces over us. This cannot be so. It is true, there are rocks having a celestial origin; they are called meteorites.

It is probable that accessions to the rock masses upon our earth have been made to the amount of several million tons of meteorites during the past ages, but they all have a distinct and peculiar character and composition. They are unlike our field rocks, and cannot be mistaken for them. I have in my hand a portion of a meteorite which is exceedingly interesting to us all, I trust. It is peculiar in its nature and history, and will well repay examination. In looking upon it, it is impossible to help asking, From whence came this rock? It is a fragment from the great Iowa meteor, which fell on the twelfth day of February last, and was sent to me by Prof. Irish of

Iowa City. There is so great interest attached to these celestial visitants, I know you will pardon me if I diverge a little from the path I have marked out, to call your attention for a moment to this class of rocks. They may be designated as bowlder rocks, for they come to us in fragments, and they certainly are "out of position."

The meteorite from which this came was of immense size. It illuminated the whole State of Iowa, and part of the adjoining States of Missouri, Illinois and Wisconsin. In April and May last, while the farmers of Iowa County were cultivating their fields, about four hundred pounds of the fragments of this great stone were picked up, and they have been carefully studied. The weight of the entire mass probably exceeded five thousand pounds; and it rushed through the atmosphere with great velocity, causing a rumbling sound like distant thunder. The number of fragments recovered, up to within a few weeks, is a little rising one hundred. The question arises, From whence came this stone, what is its history, and what is its origin? The matter of which it is made up, corresponds to the elementary forms of matter which we find existing upon our earth. We do not find in a meteoric mass any new element; but their chemical constitution is peculiar, inasmuch as they always contain certain metals, as iron and nickel. It is highly probable that meteorites are fragments of exploded planets, although I know different views are held by scientific men upon the subject. It is also highly probable that the interplanetary spaces are filled with these fragments, most of which ultimately fall into the sun, and serve as fuel for that great central orb.

These fragments hold regular orbits around the sun, in precisely the same way as does our earth; and it is only when they come in contact with the upper strata of our atmosphere that they are made visible to us, and are attracted towards our planet.

Now, in order that we may get some idea of the movements of these strange bodies, allow me to suppose that our own earth, by some great convulsion, should become disintegrated, —that it should burst into a very large number of pieces,— what would be the result? The fragments of our planet would move on, becoming more or less erratic in their

orbits; they would continue in their course around the sun, although subjected to the action of disturbing agencies greater than is our planet. The smaller portions would feel the disturbing influence first, and, moving inward, become entangled in that attenuated form of matter which exists in the interplanetary spaces; for I suppose we must admit that, in the immense abyss above, there is a resisting medium. It used to be supposed that there was no resisting medium in space, but there is good evidence to the contrary. Modern science has shed much light upon this interesting question.

Now, if fragments of our earth, of the least density, in their movements around the sun, should meet with resistance, their orbit would become changed, and the lighter particles would begin to form an orbit more erratic than the heavier ones,—those composed of the dense metals; consequently, the first specimens of our earth falling upon the planets would be made up of the lighter kinds of minerals, the substances forming the upper crust of our earth, and they would fall upon those planetary bodies which are inside of our orbit. They would gravitate towards Venus, that body having its orbit inside of that of our earth. If there are inhabitants upon that planet having mineralogical cabinets, a considerable number of years would elapse before they could place on exhibition specimens of our exploded earth representing its complete chemical and physical character. First would come to them the lighter fragments; and then, in process of years, the heavier particles, the metalloids and metals. The gold and the platinum would be the last to reach them. We have received from exploded planets outside of our orbit but comparatively few of the elementary principles known to us, and it is probable the list may not be much further increased for centuries.

You will find in the Smithsonian Institute, at Washington, a very large and peculiarly-shaped meteorite; and a very remarkable collection is found in the British Museum, all arranged in perfect order, and by a perfect system.

The chemical analysis of the meteorite which I hold in my hand differs from that of others which have been examined, and it indicates that it belongs to the first instalment of those stones which may be expected to reach us in process of time from

the same source. It belongs to the "upper crust," the lighter portion of the parent mass. It contains seven per cent. of iron, one-tenth of one per cent. of nickel, seventeen per cent. of calcium, forty-seven per cent. of silicon, and twenty-seven per cent. of ferrous oxide, or oxide of iron. It has been found that some of these celestial bodies contain as much as sixty per cent. of iron, showing that they belong to the denser portions of the planetary masses, which have become disrupted from some cause.

It is an interesting fact that we do not find these meteorites to contain any *new* elements or forms of matter; that is, no elements not common to our earth are held by them, and this fact leads to the conclusion that throughout the universe there is unity of design in physical constitution, as well as in mechanical arrangement. Spectroscopic observation, it is true, in the green line of the spectrum of the sun's light, indicates the existence of an unknown element; but it is probable, as has been intimated, that it may be the primary form of matter, from which all other forms are by some unknown celestial chemistry evolved.

Of course, gentlemen, there is much of what I have said in relation to meteorites that is perhaps to be regarded as still within the domain of hypothesis; but there are strong evidences of the correctness of the statements notwithstanding. Pardon this diversion from the strict line of my topic in bringing the interesting subject briefly to your attention.

I have already observed that the constitution of bowlder and all other rocks is very simple. There is a vast number of different minerals found in our cabinets, but they differ only in the proportions of a few elements, and in crystalline structure. Granite predominates in the rocky framework of our globe, and consequently in the bowlders we find this class of rocks by far the most numerous. In the drift or bowlder rocks of this State, more than half are granitic in structure.

Before passing to consider kinds of rocks, let me ask and briefly answer the question, What is the nature of a rock? Rock is dead inorganic matter,—burnt out material which is incapable of any change other than disintegration by chemical or physical causes. It is the coke remaining from the combustion of a world, to use another and perhaps not quite scien-

tific comparison. Rocks are bodies saturated with oxygen; and therefore are at rest.

Plants differ from rocks in a wide degree; they are composed of matter in a state of unrest. They possess a principle which is called vital force, and which leads to constant change until a state of maturity is reached, when, owing to the waning of the vital forces, the antagonistic chemical forces step in and produce decomposition and decay. A plant is under the protection of vital forces during the term of its life, and it has powers of resistance sufficient to keep at bay all oxidizing or chemical agencies, until the time comes when it must be resolved back to earth and air from which it came. Rocks by disintegration and chemical change become the food of plants; that is, the mineral elements are lifted as it were by the aid of vital force into the structure of plants, and they become integral portions of plants. They thus subserve a most important office,—dead, inert, and useless as they seem to be. They encumber our farms, mar the beauty of our fields, break our ploughs and harrows, and cover soils which might be devoted to wheat and corn; and we scold at their presence, but let us remember that it is from their hated masses that the very pabulum of our cereals is derived, that it is due to them that there is anything to cultivate in our fields.

The kinds of rocks found in our fields in Massachusetts which belong to the drift period, are, as I have said, not numerous. Granite of different kinds and colors prevails most extensively; next come quartz, talc, gneiss, and the iron-stones. The latter are found to be quite numerous in the northern counties of the State. In these stones, sulphide of iron forms a prominent ingredient, and when taken from the ground and exposed to the action of the air, chemical change ensues, and oxide of iron is found upon the surface, giving to the stones a reddish hue. This form of rock is very undesirable for building purposes, and should be avoided. The stone, when split open, affords to the inexperienced no special evidence of the presence of iron, and in spite of the care exercised in the construction of my buildings, several of these stones got in place in the walls, and already are covered with rust. Paint will be needed to protect them from further action.

In illustration of the singular variety and juxtaposition of rocks found upon my farm, I desire to call your attention to the two varieties which I hold in my hands. One is a fragment split from a bowlder weighing, perhaps, five tons, and is very nearly pure quartz; it is white and beautiful. The other is a granitic iron-stone, broken from another bowlder of equal weight, lying, perhaps, about two rods distant from the quartz bowlder. How different are those specimens physically and chemically? I have here other specimens which more fully illustrate the dissimilarity in the bowlder rocks found at my farm. These rocks serve to impress upon our minds the conviction that they do not belong to any one locality, but have been brought from different, and in some cases distant, points, by an agency the nature of which we have no positive knowledge. Finding, as I have, specimens of talcose slate at the farm of a variety which is supposed to be peculiar to the mountains in northern New Hampshire, I am led to ask, By what agency was this rock transported from those distant localities? It certainly could not have come by human hands. The same question may be asked of the granites, the quartz rocks, etc. From whence came they, and how?

I have said that we have no positive knowledge of the method by which these rocks have been deposited upon our farms; but we do have very plausible and reasonable theories which, in a measure, satisfy our inquiries. These rocks afford evidence, not only that they have been broken from bed-rock at distant points, but also that they have been subjected to some grinding, polishing force, long continued. You observe upon this rock which I have in my hands groovings and striations which could only be caused by its having been forced over another and harder rock, in some movement to which it has evidently been subjected. This stone I picked up on my hill, as it was thrown out of a trench by workmen, and is only one of hundreds I have found bearing similar markings. In the larger bowlders which are imbedded in the soil, I find these groovings to have determinate positions; that is, the lines run for the most part in fixed directions, usually north and south, or perhaps north-east and south-west, showing that the movement in which the rocks were involved was from the north towards the south in general.

You observe, further, that these bowlders have been nicely polished upon their surfaces, and the edges so ground down and rounded, that they resemble the stones we find upon sea-beaches which have been under the action of the waves for long periods of time. All these facts and appearances point to the action of water, or, more distinctly, to the action of ice and water. Now, as I find these rocks upon a hill one hundred and twenty-five feet high, or that height above the surface of Lake Kenoza, the question arises, How could water and ice reach that point to exert such extensive influences upon the hard surfaces of rocks? This inquiry leads to a brief consideration of a period in the history of our planet known as the great Ice Age, which is supposed to have existed during a portion of the post-tertiary period.

Assuming that the bowlder rocks upon my farm, and upon your farms, gentlemen, have been brought by the agency of ice to their present positions, let us inquire as to the area over which this movement extended.

If we look over the map of the United States, and survey all that immense extent of country north of the line of 40°, we obtain some idea of the magnitude of this movement, so far as North America is concerned. The area covered by drift includes the whole of New England, New York, Pennsylvania, Ohio, and some of the Western States. All over this section we find these bowlder rocks, and in association, we find immense deposits of gravel, slate, sand and clay, all mingled in a homogeneous mixture, with the exception of the blue clay, which usually forms a distinct layer. A theory formerly prevailed, and is even now entertained by some geologists, that this portion of our country has been submerged; that the sea, or salt water, covered the whole of this vast area in a comparatively recent geological period; and that floating icebergs, coming from the north, were the carriers of these stones, gravel, etc. It is undoubtedly true that icebergs are capable of transporting stones, and do transport them long distances in our own period, but this theory does not account for all the observed facts. There are certainly a great number of difficulties in the way of the adoption of this hypothesis. In the first place, there is not evidence sufficient to prove that the New England States, or

any of the Northern States, have been covered with salt water since their upheaval, or certainly not since the post-tertiary period. We find no marine shells, or ancient beaches, no evidence of the existence of cretaceous deposits, in any of the northern sections of our country. If seas had prevailed here, these evidences of the fact would most certainly appear. What is known as the glacial theory, much more satisfactorily clears up the mystery, and sheds light upon the interesting problem. It is supposed that in a remote epoch of the earth's history, the whole northern section of our country was covered with a vast sheet of ice; that this icy covering moved down from the north in accordance with the laws governing the movements of glaciers, and brought along with it the vast accumulations of bowlders and drift material which we find everywhere deposited.

If this be true, curiosity may lead you to inquire how far these materials have been transported, and how long the ice continued. The first question can be answered approximately, the second rests upon hypothesis. Observed facts show that some of these materials have been transported ten, twenty, fifty, and in some cases, one hundred and fifty miles. I have before alluded to this point, and will not dwell upon it longer. It is supposed the ice-covering continued through a period of at least one hundred thousand years, and that it commenced about two hundred thousand years ago. This is, however, pure speculation. Now, this sheet of ice must have been of immense thickness, for it has left evidence upon the sides of our mountains of this fact.

Prof. Dana says that it could not have been less than five thousand feet in thickness in the more northern portions of New England; and in the southern portions, it was probably two thousand feet. There are certain facts which lead us to believe that this view is correct, for the ice must have covered very nearly the whole of the mountain regions of New Hampshire. Only about one thousand feet of Mount Washington was left uncovered; and the whole of Monadnock, and the Green Mountains of Vermont, were hidden by the ice. The same may be said of the mountains in the western part of Massachusetts, and those in the Adirondack region.

Whenever, gentlemen, you visit Monadnock, a mountain

which is quite within the field of vision from these hills around this city, you will find, upon the northern and north-eastern sides of it, evidence that it has been subject to very severe ice action. It has been torn, and bruised, and scored by the action of moving ice; and you will find the same thing true, to a considerable extent, in the New Hampshire range of mountains. You will find that their rocky sides, at elevations of a thousand, two thousand, and five thousand feet above the valleys, afford evidence of rough usage from this descending mass of ice. At this stage of our remarks, you very naturally inquire, How came this frigid condition to prevail at this particular epoch in the history of our planet? To attempt to answer this question, would lead me into a field of speculation, in which we might wander for a great length of time. Some most ingenious and plausible theories have been advanced to account for the great reign of ice, but I have not time to present them for your consideration this afternoon. I will simply remark that evidence is afforded that there has been more than one glacial period, and that another is not improbable; but the time for it to commence is so remote, I think we may venture to plant our corn as usual, without fear of having to dig for the crop through a covering of ice.

The moving of glaciers is a puzzle to many, and therefore I will briefly allude to this point The motion of the great northern glacier which brought to us the bowlder rocks was probably exceedingly slow. It moved down from the north, taking our valleys and river-courses in its path, and so great was the propulsive force, that it glided over the hills and lesser mountains without difficulty; nothing could obstruct its onward flow. We get a very correct idea of the movements of ice from a study of the glaciers which exist in Switzerland at the present time. I suppose it may be a novel statement to some, when I tell you, that at the present time, more than 1,500 square miles of Swiss territory are covered perpetually with ice, and the whole of the land north of the lower quarter-section of Greenland is also covered continually with solid ice masses. The same conditions exists in Greenland to-day, as far as glacial action is concerned, that existed here thousands of years ago. Now, if we have glaciers existing at the present day, and if we study their action, we must obtain some facts,

some knowledge as to their movements and laws, which will throw much light upon the subject.

But it is not necessary for us to go to Greenland or Switzerland to study glacial action, for we have glaciers in our own country. They are found in the northern part of California; we have them existing upon the sides of Mount Shasta, which rises to the great altitude of 14,000 feet. We also have them in Colorado; and there we find one of the most remarkable exhibitions of the erosive action of ice which can be found upon our globe. According to the report of the United States Surveying Expedition, under Lieut. Davis, he discovered a vast channel in the side of one of the Colorado mountains, which the ice had cut down through solid rock. The walls upon either side are more than one thousand feet deep, and they extend down nine thousand feet into the valley below.

It is, however, in Switzerland that ice movement has been systematically and fully studied. Prior to 1827, there was but very little known regarding the motions of glaciers. During this year, observations were made in Switzerland which proved conclusively that these masses of ice which extend up from the valleys on to the mountains were in a state of constant motion. If you start from the little town of Meyringen and go up the Hassli Valley, following the Aar River, you soon come to the Handeck Falls. At this point, by turning to the right, you will reach a glacier which possesses very great interest. It is the one upon which the first observations were made by any competent observer. Three years ago, I followed this route to reach the glacier. In 1827, a French *savant* visited this glacier, and erected upon it a little hamlet, and resided there and made observations continuing through several months; and when he left it, it was not visited again until 1830. When Prof. Agassiz first began his studies, he went up through this valley and reached the glacier, in 1830. He found that, from 1827 to 1830, the little hamlet had moved 327 feet down towards the valley. Ten years later, in 1840, the same structure had moved 4,000 feet. This proved conclusively that glaciers moved, and experiments were undertaken, by Agassiz and others, to ascertain the rate of motion; and the devices for obtaining

this knowledge are now so perfect and delicate that it is not necessary to wait a year to prove that a glacier moves. By the use of a theodolite, and other modern appliances, you can ascertain the distance which a glacier moves in a single day, —yes, in a single hour. They move with different degrees of rapidity; they move as a river moves in its channel.

In two visits to the glaciers of Switzerland, I have had opportunities of observing this most interesting phenomenon of ice movement, and I know of nothing upon our earth that awakens in the mind a greater degree of awe and solemnity than these great glaciers. As you walk upon the sea of ice, the cold, the solitude, the absence of all life and vegetation, the deep silence which reigns,—only when those deep, detonating noises are heard echoing among the rocks, which proceed from falling masses of ice, or from the cracking of the main body,—all these awaken in the mind a high degree of awe, and almost of terror. The motion of a glacier is greater in the centre than it is upon the sides. If a line of stakes is placed across a glacier, we find that the rate of travel in the centre is more than double that upon either side. The ice-stream obeys the same laws in descending from a high altitude to a plain that water does, and it is held in check and diverted from its course in the same way. Vast quantities of rocks, pebbles, sand, etc., are brought along and piled up by the sides of the glacier, or at the point where it terminates in the valley. These deposits are called *moraines*, and are often of great extent, forming high hills and ridges. It is probable that some of you have visited the great glacier which descends from Mont Blanc into the Valley of Chamouni, in Switzerland, and observed the terminal moraine formed at the point where the ice melts as fast as it descends. This is an interesting object, and illustrates forcibly the great power of ice action. Embedded in this moraine are seen huge bowlder rocks, which have been detached from the surface of the mountain thousands of feet above the valley, and slowly brought down and deposited by the melting of the ice. In this way it is probable the bowlder rocks upon our farms have been transported from distant points. Slowly, through the long ages of the post-tertiary period, they moved down from the north, embedded in the thick ice, and, by being

forced over other rocks, and ultimately coming under the action of water, as the ice melted, they have been rounded and polished, many of them, in a remarkable manner. We find ancient moraines existing all over the Northern States; and there is good reason for believing that the long ridge of hills, upon one of which I have placed my stone buildings, in the rear of this city, is an ancient moraine. The nature of the deposits, and the formation and arrangement of the hills, leads to this conclusion. There were no lateral or medial moraines formed during the glacial epoch,—only terminal moraines; and such, of course, is the one to which I have alluded.

Now, gentlemen, from the statements and facts which I have most imperfectly and briefly presented, some idea may be obtained of the probable origin and history of our bowlder rocks. There is no other theory which will satisfactorily account for their presence but the one presented, and we may regard it as true until a better one is brought to notice, —one more in consonance with observed facts around us. This knowledge cannot but help to increase our interest in these stranger rocks, and lead, not only to their further study, but also to the study of our soils, so intimately connected with them.

Now, allow me to call your attention to another point; and that is, the utilization of these rocks in the construction of buildings. I have long felt that they could be more generally used, without involving too much cost, especially by farmers, who have them in so great abundance within easy reach. So confident had I become, that in neglecting the use of these rocks for building purposes we were committing a grave mistake, I determined to test the matter by practical experiment. As I have before said, the structures which I erected, consisting of a large dwelling-house and stable, designed for a summer residence, involved the employment of more than thirty-five thousand cubic feet of bowlders, all of which were taken from the surface of the hill upon which the buildings stand. The area covered by the rocks, before their removal, is about four acres, and so sparsely were they dispersed over the field, that they were not regarded as a serious detriment to its uses as a pasture. The quantity of rocks which a field will

supply can only be understood by those who engage in their removal. No one having land, moderately rocky, need fear a want of supply in any uses for which he may need them, if the undertaking is of reasonable magnitude. I am fully satisfied with my experiment, both as regards the elegance and the cost of the structures. As building-material, I know of none more beautiful or desirable, and when we take into account durability and exemption from repairs, we are forced to regard these rocks with favor. It is, indeed, a pity our forefathers, in erecting farm-buildings, treated them with neglect. If stone had been used instead of perishable wood, how many antique and interesting cottages and barns would line the roadways throughout New England. The country, instead of presenting a desolate and uninviting appearance, would be full of ancestral homes, most of which would be warm and habitable. Old England is dotted all over with these stone buildings, many of which are, of course, most humble and unpretentious, but still, they are interesting from their antiquity and family histories. Every structure here in the country is perishable; our buildings of wood are built for to-day, and scarcely last through one generation. What sight is more melancholy and dispiriting than the old tumble-down, wooden farm-houses which are seen by every roadside in the country? No wonder the sons of our husbandmen flee from them to the cities; they convey to the mind of youth no emotions of home, no symbols of thrift or permanency. It is natural to flee from dilapidation, decay and ruin. It seems to me that in the erection of more permanent homes lies the hope of New England husbandry. What we need to retain our boys upon the farm is, more attractive surroundings; indubitable evidences that there is something *solid* and *enduring* and comfortable in farm life; and also, it is important that there should be evidence afforded to the minds of youth, that expenses for repairs of homestead buildings will not eat up the prospective profits of the farms. Why, if a son succeeds his father upon a farm, and the buildings are of wood, and kept tidy and attractive with paint, the cost of painting, once in four or five years, will exceed the amount of taxes, state, town and county. This is an item not lost sight of when a young man decides to abandon the paternal

estates. The risk from fire is also to be considered, and also the rates of insurance.

As regards cost of construction, I may say that any farmer in Massachusetts can build of bowlder stones cheaper than of wood, provided he has the stones convenient of access, and possesses a fair share of perseverance and skill. In case any of you, gentlemen, desire to replace your wooden buildings with stone, I would advise you to move in the matter leisurely. Take time for the work, and do a large share of it yourselves. The expense of the mason-work proper is but a small proportion of the cost, and this, with the inside finish of wood, which may be as plain as is desired, is about all that will require a direct outlay of money. The outside material costs you nothing; the lime and cement are not expensive at the present time; and, so I say, for a less expenditure of money, more comfortable and tasty dwellings and outbuildings of stone can be erected than of any other material. The labor can be performed in the winter months, and it should be understood that it is not necessary to hammer or form faces upon the bowlders, in order to secure beauty of design or finish. The stones taken from the fields and placed in walls, with very little hammering, give most pleasing results. Of this description is the new and beautiful dwelling erected recently by Mr. Mitchell (Ike Marvel) at New Haven. The round bowlders are placed in the walls without a hammer being allowed to touch them, and the effect is very fine. If split bowlders are desired, you can do your own splitting, and not only that, but you can make your own tools, drills, wedges, etc.

For about twenty-five dollars you can buy a portable forge, —and, by the way, it is an implement which every farmer should have,—and with this you can make the steel tools required, and temper and sharpen them when dull. I speak in this matter from experience, and therefore I speak confidently.

There exists a prejudice with some against stone structures, on the ground that they are cold and damp. This objection I have found to be groundless. I left my buildings last winter, freshly constructed as they were, without artificial heat, and I found no evidence of moisture, not a single door in the

buildings or any of the finish was affected by moisture, and during the past summer's residence there the objection was not observed.

In the construction of stone buildings, it is important that an air-space at least four inches in depth should be arranged between the wall and the ceiling, and with this the air within is uniformly dry and comfortable.

I hope, gentlemen, I have not wearied you with this topic. I have endeavored to group together in popular form, some of the facts and principles of modern geological and chemical science which have a bearing upon the history of bowlder rocks, and if I have excited so much interest in the subject as to lead you to make further investigations, one of the objects had in view will be attained. Perhaps we may learn, from what has been stated, that the most common objects found upon our farms have a history full of interest, and that no substance with which we are brought in contact in our daily labor is unworthy of our attention and study.

Mr. Vincent, of Edgartown. More than a half century since, I heard it stated that there was a bowlder on the northwesterly side of Martha's Vineyard, which, it was said, had its counterpart on the main land. It was affirmed, that, having evidently been split off from some other portion of rock, no such portion was to be found in the vicinity; but that, upon examination, the split side corresponded exactly with one side of the rock referred to on the main land, both as to size and shape. I heard it from very respectable gentlemen; but, never having seen and compared the two myself, of course I cannot vouch for the reality. Science might profit from a substantiation of the alleged fact, as it would furnish an unmistakable evidence of the glacial theory, taken in connection with supposed as well as known changes along the coast of Massachusetts, caused by the wear of the ocean by force of winds and tides.

I assume that this island, with some smaller neighboring islands, was a part of the main land; that it probably became separated from it first by the water obtaining a narrow run through some of the lower parts of the land, which run of water in time grew by the action of the known powerful tide

and the waves setting through there, to its present width of about four miles, bearing on its bosom a large part of the freights of the nation. In evidence of the reasonableness of this theory, are the facts, first, that on either side of this Sound the shore-line is bordered by high cliffs, peering up at an angle of forty-five degrees, and which, on the Vineyard side, I am sure, have been very considerably worn and washed away within the memory of man, insomuch that lighthouses on those highlands have had to be removed further inland from the frittering edges of those cliffs. Then, the large shoals, far down east from the Sound, show where much of the sand washed out *may* have gone.

All this being so, it is easy to concede that, in some great glacial movement two hundred thousand years ago, or more, which would naturally be from a northward to a southerly direction, this portion of rock,—split off by the movement when full of frost,—being attached to the immense mass of drift, was carried to its alleged location. It may be objected, that this part of the rock being on quite elevated land, it would not be likely to be deposited there. But the part was declared to be a bowlder, and as such, the question is, How did it come there? Besides, the land itself on that part of the island may have been, and probably was, in the long past, an upheaval, to some extent. This view is, at least, inferable from the fact, that, in the cliffs of Gay Head, which are on the same side of the island at the extreme west, and but a few miles from the alleged location of the bowlder, are marine fossils frequently making their appearance far up,—say from fifty to a hundred feet above the sea,—showing unmistakably those headlands to have been an upheaval. Finally, even though this rock has not its other part, as held, anywhere, it is said to be a bowlder, and, as such, the question recurs, How did it come there?

The Board then took up the subject of Vegetable Culture and Market-Gardening, and Mr. Hadwen, of Worcester, was called upon to open the discussion.

Mr. O. B. Hadwen, of Worcester. I am entirely unprepared to open so important a subject. If any gentleman will name any vegetable for cultivation, I will give what facts I know in relation to its cultivation in a very concise way.

Asparagus.—The cultivation of asparagus, which, perhaps, those living in the immediate vicinity of cities and large towns are more or less engaged in, is one of well-known importance. There are many ways in which asparagus has been successfully grown. I have grown it for about thirty years as a market vegetable. I have raised it from the seed, and it still remains in the bed where it was originally planted. Perhaps it is unnecessary to state that the ground should be made rich in the commencement, and continued rich throughout the after-years of its growth. My practice formerly was to sow asparagus in rows, some two feet and a half apart, after enriching the ground, thinning out the plants to about eight inches in the row. It has been my practice to top-dress the bed with well-decomposed manure every spring, and the constant accumulation by the top-dressing (sometimes putting on sand, if on clay soil) is congenial to the growth of the asparagus, and you will get good returns. Asparagus is a crop which remains in the ground for a long time. My bed, which has been planted for about thirty years, was never more productive than the last season. I have younger beds, but I find I get the largest stalks from the old ones. It is a vegetable which we all know something of. As an old farmer once said, "It is like pork in the cellar to have a good bed of asparagus." It is the earliest vegetable we have, and always satisfactory on the table. I would state further, that the bug, which is found very troublesome in some sections, I have had no experience with.

Mr. Cheever. I would like to ask the best way of treating asparagus in the fall, before the tops naturally die, while it is maturing its seed? Whether to mow early, before the crop is matured, and remove the tops, or let it take its natural course,—let the seeds drop and come up the next year as weeds? What is the practice of the best cultivators? I would like to have that question answered, if it can be.

Mr. Slade. The gentleman puts his question in such a way as would prevent me from answering. He wants the opinion of "the best cultivators." I do not profess to be among the best cultivators of asparagus, or anything else, as to that matter. I grow some asparagus, and in regard to the question, what is the best disposition to make of it in the fall, I would say, that I mow mine and burn the tops on the beds, and when it is convenient, I top-dress, and work in the manure with the cultivator or plough.

Mr. Cheever. At what time in its growth, if you please?

Mr. Slade. About the time that it gets through growing; about the time of the appearance of frost. In cultivating asparagus, I have been troubled more or less, as we all are in our section of the State, with the beetle, or fly, or whatever it is, that eats the tops, and we have to keep it off. I do it in various ways. I usually, at the season of the year when they are most prevalent, have a little broom, with a handle about three feet long, and go along between the rows, and just brush the tops (I can go over an acre in about an hour), and then follow with the cultivator immediately. I do not claim that this destroys the injurious insects, but I do claim that it obstructs them in their work very much; it keeps them back for a long while. And at the same time that you are doing this, you will find that there are slugs on the branches of the asparagus, all ready to hatch and eat, and you knock those off, and of course destroy that coming pest. In that way I manage to keep them off. I did so this season, until about the last of August or first of September, when they rather got the advantage of me, as I thought. I brushed them a few times, but still the tops died. They ate them down. And to be certain to get rid of them, about the middle of September I mowed the bed, cut it close to the ground, the whole of it, put the tops in winrows, and as soon as they were dry enough, burned them and destroyed everything. That I have done heretofore, but never so late in the season. I have done it about the last of July, for two years certainly, which I think had a very beneficial effect in destroying the insect. I did it in the year 1873, and in the year 1874, I was not troubled at all with them. The next year, this last year, I was troubled to this extent of which I speak.

I do not claim to be among the best cultivators of asparagus, but I know there are gentlemen present who raise it very successfully, and I would like to hear from them on one or two points. I would like to know how they treat the insect; and I would like to know if they are troubled with this sort of spiral growth, which, although not very common, prevails to a certain extent. It is something that I cannot account for. At one time, I supposed that it was owing to a grub eating the shoot under the surface of the soil, when it first started; but, on examination, I never could find anything that satisfied me that that was the cause. I did not know but it might be owing to the nature of the manure, or to the fact that there was too much clay in the soil, as I suppose there is in the soil which I use to grow asparagus; but I find, by talking with other cultivators in our vicinity (Mr. Paul, of Dighton, for instance, who is here), that they were somewhat troubled in the same way, on sandy soil. If any one present can answer these questions, he shall receive my thanks.

Mr. Hapgood. I have a bed of asparagus in my garden, and I have noticed, occasionally, a shoot coming up in the spiral form to which Mr. Slade refers. I have always supposed that that was caused by want of care in dressing the bed. Mine is a small bed, and I use a fork to work in the manure; and when I do it myself, I do it as carefully as I can. But I find that a prong of the fork frequently strikes the crown of a plant (which, as you know, is of considerable breadth, under ground), and I always thought that was the cause of its growing in that form.

Mr. Dwight, of Dudley. I would like to inquire of Mr. Slade if he ever puts any salt or brine on the bed?

Mr. Slade. Yes, sir, I have done so. I have used forty bushels, I think, on a quarter of an acre this last year. I put it on in August. Not that I really supposed that the health or growth of the plant needed it; but I used it because I supposed it would have a tendency to keep down the weeds, which I think it does. I am not certain in regard to the application of salt to asparagus. It is usually considered a marine plant, because it has been found on salt-water beaches, where it is washed by the water, growing in a natural state.

But it is also found inland, growing in a natural state, wherever the seeds may be carried and dropped by birds. So that it would seem that there is no truth in the theory that it is a marine plant, or that it requires salt. I have made three applications of salt to my asparagus since I began to grow it, and I have never been able to discover that it made any difference in its growth—whether it made it any larger, or whether it retarded its growth at all. I think, and have always thought, that, on the whole, it was as well not to use it. It may be beneficial in killing weeds, but of course the temperature of the soil is reduced by the application of salt (at least, so it seems to me), and consequently it makes the plants later. The early asparagus is what we are after, and I would not recommend anything that will lower the temperature of the soil or keep the plant back, which I think the application of salt will do.

Mr. Cheever. If this asparagus question is settled, I would like to ask one other. I intended to have brought some potatoes here to show; but in the temperature in which we came they would have been frozen potatoes when they got here. There is a great deal of complaint all through the country, as far as I know, of scabby potatoes, which is attributed to various causes; but I have never yet found many intelligent people who were sure that they knew what caused it. But if any one can tell the cause, or give any clue by which we can learn it, and the preventive, I think it will be a great help. I presume this is something that potato-growers all understand without specimens being shown them.

Dr. Nichols. I want to ask Mr. Slade if there is more than one variety of asparagus?

Mr. Slade. I give only my opinion, from having cultivated what was said to be a second variety. My idea is that there is only one variety. The difference is made by culture.

Dr. Nichols. You get those large specimens by cultivation?

Mr. Slade. Yes, sir.

Mr. Paul. I would say one word in regard to that. When I set out my first bed of asparagus, I had two varieties; that is, I purchased one variety in Boston, raised in

Townsend, I think, and the other came from Connecticut, which professedly was "Conover's Colossal." I sowed them in the same field, and gave them the same cultivation. I don't know whether the "Colossal" was larger or smaller than the other, but it has not produced plants half the size of the other, purchased in Boston.

A question was asked by Mr. Cheever in regard to mowing asparagus. That is a point upon which I wished to get information when I came here. I have inquired, and have not been able to learn all I wished to in regard to that. The second year after the plants were set, I let the seed mature, having gathered the impression from some source that it would be an injury to mow the plant. The seed remained upon the branches and finally dropped, and the next year they vegetated and grew; and, for myself, I should about as lief take a piece of sward land and attempt to hoe it without ploughing as to hoe my asparagus field the year following. It certainly would not pay me to cultivate asparagus if I must let the seed mature. A man who raised asparagus years ago, and successfully, I suppose, having seen my field mowed every year succeeding that, told me I missed it by doing that, because there would be bleeding of the stalks in consequence of the mowing. I replied that I could wait until after the frost had killed the stalks and prevent any injury. But he referred to a fact in his own experience, and said there was an injury, because in one instance he mowed one portion of his field, and the following year there was a small crop on that part, while on the other part the crop was as large as usual. I wish to know, from those who have had experience, whether it is safe and proper to mow the tops.

Mr. Wetherell. In regard to the question asked by Mr. Cheever, I will state that a farmer in Kingston, in this State, sent me, in the month of September, a potato in the condition which he describes, saying that it had long been a mystery what the cause of that condition of the potato was. The person sending it in that "scabby condition," presented with it an angle-worm or earth-worm, that was in the potato at the time he discovered it, and was still in the potato at work when it was received. It had been to this person who sent the potato, as to the gentleman who made the inquiry, and

as he says, with others, a query what produced this condition of the potato; and the conclusion arrived at was, that it was the earth-worm, which, it has often been said, is perfectly harmless to the farmer, and not only harmless, but beneficial, as a means by which the aeration of the soil is promoted. It seems, however, that the earth-worm is one cause—whether it is the only cause or not, I cannot say—of the scabbiness of the potato. I am sure it was in this case; and it was a good specimen of the scabbiness to which our friend has referred. Whether there are other agencies producing similar effects, I am not able to say. Perhaps others have had observation and experience on that point. I should not have stated this fact, had it not come under my own observation. I do not doubt that the potato is more or less perfect according to the conditions under which it is grown. An unfavorable condition may be favorable to the working of these worms upon the surface; but the condition of the soil being good and adapted to the growth of the tuber, I do not doubt is favorable to the propagation of healthy tubers, such as every farmer seeks to grow.

While alluding to this subject, I will add one other word. A farmer said a few days ago, "One great defect of farmers in growing the potato, is, that they do not take care to get choice varieties, and then to apply the best culture, and having done that, then to seek the right market to sell those potatoes." He told me he had no difficulty in selling all the potatoes he had to spare for a dollar a bushel, and those who purchased them would willingly continue to pay that price, if he could have continued the supply. He said to me that one defect among our farmers, was, that they did not take care to grow good things under favorable conditions. If he could sell all the potatoes he could furnish for a dollar a bushel, from a town in Middlesex County, he said he did not see why other farmers should be selling theirs for forty, forty-five and fifty cents a bushel.

Mr. Cheever. About how long was this angle-worm?

Mr. Wetherell. Not very large. It was rather small; but evidently, from examination, in the growing state of the earth-worm.

Mr. Cheever. One, two, three or four inches?

Mr. WETHERELL. I did not measure it, but I should judge about two or three inches.

Mr. CHEEVER. How deep in the potato was the worm?

Mr. WETHERELL. Not very deep; partly upon the surface. About the depth of the thickness of the worm, which was, perhaps, nearly a sixteenth of an inch.

Mr. CHEEVER. How could an angle-worm, three inches long and of proportionate size, keep inside of a potato in a hole only an eighth of an inch deep?

Mr. WETHERELL. It was working along under the skin of the potato. I do not know how it kept itself there. I did not examine particularly to ascertain how it kept itself there, but the fact was before my eyes. President Allen, of the Agricultural College of Maine, says that lime put in the hill is a very good specific.

Mr. PAUL. On one occasion, in examining carefully some potatoes that were in the condition spoken of, I discovered a very small white maggot, closely resembling the maggot of the common house-fly, but so minute as to be scarcely visible to the naked eye. From the position of this worm, I became satisfied that it was the cause of the scabby appearance. In conversation with several persons since, I have not found any one who has observed the same thing. I feel confident that the cause of this trouble is not the angle-worm. My impression is, that during the period of growth, this worm punctures the skin, and, in its growth, the skin opens, leaving that appearance of scabbiness upon the surface. Probably an examination by the microscope at the time of growth would show that fact, if it is so. In regard to the remedy, I am quite confident that the use of fish-manure, fish-pomace or fish-refuse in the hill—used carefully, so as not to injure the germination of the potato—would be a remedy. At least, whenever I have used it, as I have done several times during a period of eight or ten years, I have never known my potatoes to be affected in the way that has been described; and feeling confident that it was a remedy, I have inquired of a number who have used it, and I have never heard of any one who used it who had this scabbiness on his potatoes. It is my impression, therefore, that it is a specific.

President ALLEN, of Orono, Me. I merely made the sug-

gestion that down in Maine we use lime with good effect as a remedy for scabbiness. We do not cultivate sufficiently or manure sufficiently, oftentimes, to cause scabbiness, but when we undertake to raise potatoes in our gardens, which are thoroughly manured and dressed, it is frequently the case that they become scabby; and from personal observation in my own garden, I have found the best remedy is to put a little unslacked lime into the hill when they are planted, and its effect is good. It does not hurt the seed. If it slacks there, it warms up the potato, and causes it to sprout quicker. I suppose this destroys the insects in the hill. I do not know that the angle-worm has anything to do with occasioning this scabbiness. If a potato is scabby, the angle-worm might find its refuge in that scabby locality, but I think it is smaller insects, not worms, which occasion the scabbiness.

Mr. Brown. I do not know that I can offer anything that will enlighten or instruct any one here. I have tried my hand at growing potatoes; I have raised all the kinds I could find, have paid big prices, and was willing to do it; have tried all modes of cultivation I could hear of; and I must say, that I have made very little progress in the matter. I can throw but very little light upon the subject.

In regard to this matter of scabbiness, I am pretty much convinced that it is caused by an insect, but I cannot point it out. The worst case I ever saw was this year, in some potatoes grown on the spot where an old building stood in front of my barns, which was torn down more than thirty years since. There was not a decent-looking potato in the lot. They were the most perfect specimens of scabby potatoes I ever saw. There was very little manure used, and the potatoes were small also. I could not lay it to the angle-worm at all. Angle-worms may bite the potato a little; but it is not a very tempting morsel to any sort of worm, I take it. I doubt if angle-worms could produce the scabby potatoes. I have been troubled with them only where the land is cultivated a great many years. In my field-land I have never seen any scabby potatoes.

Near my buildings, I ploughed a piece, and planted it with potatoes,—it was near where an old house stood,—and I got twenty or thirty bushels, and there was not a respectable-

looking potato among them. But if you will plant them away from buildings, you will have no trouble from scabby potatoes. Whatever may be the cause, it is easy enough to get rid of it. There are many worse things than scabbiness, I have no doubt. Probably no vegetable is so foully dealt with as the potato. It is planted in swamps, among rocks, and everywhere. It is manured with all manner of foul compounds. As to this fish-guano, if it were a good remedy, I would not use it. It is not treating the potato respectably to feed it with such manure. I doubt if the potatoes would not partake of the nastiness. I had some of the wretched stuff, and the neighbors complained of it more than half a mile off. I would not put that upon any field.

There is a little hard-shell worm that has troubled me more than anything else in raising potatoes, and that is the wire-worm. I have never found anything that would prevent his work. I have been troubled every year, more on low land than on high, and sometimes they have nearly spoiled my crop. If any one can throw any light on that creature's habits, I would like very much to hear him. I have tried salt and ashes and lime, and many other things, and nothing will drive that fellow away. He is a hard-shelled, pernicious fellow, and stands all manner of hardship and ill-treatment. Some people have recommended picking them out of the potatoes and pulling their heads off. That is a good process, if people have nothing else to do, but rather tedious. If anybody will tell me how to get rid of this wire-worm, I will tell him everything I know about potatoes in return.

Mr. Cheever. I won't undertake to tell the gentleman how he can get rid of all the wire-worms on his farm, even if he will tell me all he knows, which might be a good bargain; but he has suggested a remedy. Drain your land until it is not too wet, and the wire-worm cannot live there, to any extent.

Mr. Brown. I have done just that. He is on the best-drained land I have. He stands any manner of treatment with me.

Dr. Nichols. I am inclined to think that in the cultivation of potatoes we overlook the importance of the use of plaster. I have been in the habit of using plaster on my potatoes for a number of years, and it seems to me that it is a most excellent fertilizer to use in connection with

that crop. I would like to state the results of the use of plaster in a single case, two years ago. I do not know that I can give you the reason of the results, but I will make the statement, and leave you to form your own conclusions in relation to it.

I planted an acre of potatoes two years ago, upon a piece of land that had never been cultivated before. I allowed one-half of it to be cultivated by one of the workmen on my farm, and the other half I cultivated myself. Upon the half that I cultivated I used plaster in the hill, and nothing else. My workman employed manure upon his side of the field. The difference in the time of planting was about one week. I used the Early Rose potatoes for seed, and he did the same, but the seed was not obtained from the same source. The sources from which the seed was obtained were different; the method of manuring was different, and there was one week's difference in the time of planting. Now for the result. When we came to dig those potatoes in the field, I found that every one of mine was perfectly sound, and of very nice quality. Upon the other side of the lot, in the same plot of ground, all of those potatoes were diseased. It was a perfect failure—a dead loss. I thought it was an interesting fact. I have reflected upon it a great deal. The rot came and struck those potatoes in August. I allowed him to cultivate just one-half of the field. I took one side, he the other, of the line, right through the middle of the field. The rot came, as I say, and struck his potatoes about the middle of August, and they became as brown as you can imagine; while the vines upon the other side of the line were perfectly green. The potatoes upon that side matured, as I have said—were excellent; and they were a total failure upon the other. I think that is an interesting fact. I do not know how it should happen to be so; but I give you the facts in the case, and leave you to form your own opinions about it.

Mr. Wetherell, I want to ask the Doctor this question: Do you, as a chemist, regard plaster, which you recommend, as a universal fertilizer, like barn-yard manure, to be used on every farm, irrespective of conditions?

Dr. Nichols. That opens up a very broad subject. I really do not feel like going into a discussion of the subject

of gypsum, which has been the stumbling-block of chemists for a great many years. I do not know exactly how it acts, and cannot give directions how it should be applied. I only know that gypsum, under very nearly all the circumstances in which I have used it, I have found to be very valuable. I think that gypsum needs a pretty large amount of water. I think if we sow gypsum on our fields in a very dry season, we do not get any very beneficial result from it; but I think if we sow it upon the same field, in a moist season, we do get very good results.

Another thing: I think that gypsum very nearly always does well upon the north and north-east sides of hills. I think it very seldom does much good upon the southern slopes of hills. I have introduced that subject in conversation with a great number of farmers, and I found that that seemed to be the view quite universally entertained by those who have used it. Why it is so, I do not know; only I do know this: that the northern slope of hills is, of course, longer in the shade than the southern slope, and there is usually a heavier deposition of dew upon the northern slope of hills. There is more moisture, usually, upon that slope than there is upon the southern slope.

I do not know that I can add anything to the stock of knowledge regarding gypsum. I always keep it on hand; I always use it; I have sent to Maine for it. I think there is a difference in gypsum, and that some of it is of very little value. I have examined two specimens of gypsum that were very nearly half carbonate of lime, which is a form of sulphate of lime. Whether this was accidentally or designedly mixed, I do not know. I have procured very fine gypsum from Maine, and have found it to be very useful upon my farm. I use it every year. I always use it in laying down to grass. The amount we want to use is not large, because you know that very little of it is soluble. It requires a very large amount of water to render a very small amount of gypsum soluble. Therefore, it is not necessary for us to sow it thickly, but thinly, and sow it fine. These are all the facts that I think are pertinent to this subject.

Dr. Cogswell, of Bradford. The potato-crop is a crop which interests, not only the farmer, but the whole com-

munity, and whatever light can be thrown upon the question is very important to all; but I must confess that with my experience with the potato-crop, I have been unable to arrive at the conclusions which several appear to have reached during the discussion. I have raised good crops of potatoes; and under the same circumstances—almost precisely the same, as far as I could discover—I have raised a poor crop, treating them in the same way. Take my crop of potatoes year before last, for instance. They were planted upon new land, and I expected a large crop of fine quality; I had a poor crop of potatoes, and the quality not good.

Last year, on precisely the same kind of ground adjoining (there were two swells, of about an acre each, and I know of nothing by which I can state any difference in the characteristics of the soil), with the same treatment, as far as manure was concerned, applying it at the same time, and planting at the same time, I had a most excellent crop of potatoes, and the quality very superior. They were of as good quality as potatoes used to be when I was a boy, which was very different from what it has been of late years. This year, upon another farm of mine, a mile distant from the one to which I have referred,—it was pasture-land, and I don't suppose it had been ploughed for thirty years,—somewhat of a hill, with all the characteristics for a fine crop of potatoes,—I used precisely the same kind of manure which I used two years before, which was not the very best way, I admit, but the potatoes were manured in the hill with barn-yard manure. I expected a very fine crop, but instead of that I got only an average one. The quality, as far as eating is concerned, is very fair,—perhaps I ought to say good; but not as good as that of last year, though the conditions were better than those last year. But they are scabby; they are about as scabby a lot of potatoes as I have ever had. There was never any house there; there is not a house, except my own, within half a mile. I am by myself, and the field is up some thirty or forty feet higher than my house, and away from it. The land has been used for pasture; it was, in fact, covered with oak timber some thirty-five years ago,—heavy ship-timber; and since that, I suppose, it has been ploughed once. From this land I have this year got scabby potatoes, for about the first time in my

life, of any consequence. Now, year before last, at Bradford Academy, which is on a hill (it is moist land, very different from my land), they had, on the back of the hill, a poor crop of potatoes, and of miserable quality. This year, using the same manure, which was spread on from the pig-yard, they had a large crop of potatoes of most excellent quality. Neither the scab nor anything else affected them. The men there told me, within a few days, that they had never had better potatoes upon their table than grew upon that land. The land itself is not of a character to produce a good crop of potatoes; it is very moist land; it has been under cultivation certainly seven or eight years, and was dressed simply with this pig manure, with some coarse soil mixed with it.

I think, therefore, that there is something else besides manures; there is something else besides angle-worms; and something else besides cut-worms, that enters into the conditions which affect potatoes. I ought to say here that the seed used in my own ground was the Early Rose. The seed of last year, which gave an excellent crop, the seed of the year before when I got a poor crop, and the seed of this year from which I got the scabby potatoes, was the same, with the exception of three bushels which came from the State of Maine,—fine Early Rose potatoes, planted side by side, and I could see no difference.

Now, I am satisfied of one thing, which has not been alluded to here; and that is, that a sufficiency of rain coming at the right time to produce the proper setting of the potatoes and the proper growth, until they get to a certain stage, is more important than anything else that has been named here this afternoon. I have watched it for a great many years, and I have got so that I think I can predict the quality of the crop by the amount of moisture at the time that the potatoes are not only setting, but growing. I think that has a vast deal to do with it.

Mr. Bartlett, of Kingston, N. H. I have watched very closely, and very few have mentioned how they apply their manure,—whether barn-yard manure or other fertilizers. What little experience I have had in farming has brought me so far as this: that in order to get potatoes, the soil should be about right, and that, I claim, should be good corn soil, which

is about as near right, as far as I have observed, as any soil can be. Then, the manure should be applied broadcast,—whether harrowed in or ploughed in, I do not undertake to say; but I do say that I cannot raise good potatoes, as a rule, with manure applied immediately in the hill. And another thing: if applied so, it should by all means be made as fine as possible; I think that has more to do with scabby potatoes than any one thing.

Some gentlemen think the degree of moisture has the most to do with it; but I have on my farm all kinds of soil, varying from sand to semi-clay, and I have found, where I have thoroughly underdrained with tiles, I can govern the moisture of the soil to a great extent. That is, I have never found it too dry to grow a crop successfully. But on such soil, if I put fermented manure into the hill, it spoils the crop.

Question. Did you ever have scabby potatoes when the vines were green?

Mr. Bartlett. I never saw any potatoes that were scabby when the vines were green; but when we get done going to market, we leave a few potatoes in the hill, and the vines become rusty; perhaps we leave them one or two months, and when we come to dig them, if the land is very rich, we find them scabby.

Question. I wish to inquire if potatoes ever become scabby that are raised in a pure clay soil; if they do not grow fair and free from this trouble which has been discussed here?

Mr. Bartlett. As a rule, potatoes are more generally free from the scab where the tops are green; but it prevails to some extent, especially where they are grown upon land excessively rich. In such cases, where there is a rank, strong growth, I find the scab when they are not entirely matured.

We have to thank the doctors and scientific men for what they have done for us. They are great helpers to the hard-working, practical farmer; but they make many mistakes, and so do we, who do not profess so much. We make mistakes every day, but we are not in a position to have them advertised to the world, because we do not very often get up and say anything. But they are making suggestions for us to act upon; they are using their money for our benefit, to a certain extent; but I have to use my own judgment, after I have heard

or read what they have to say; and so every man must judge for himself, to a great extent, on his own farm. Yet, as a rule, as I have said, I think they are our helpers, and need to be encouraged.

I know upon my own farm plaster works admirably, in many cases. As a rule, I use it upon the higher portions of my farm. I have never made any observations whether its use on the northern or southern slope of a hill was the most beneficial, but I shall take notice of it hereafter. I would advise everybody to try it upon his farm, and not take any man's word for it. Try it for yourselves. It is cheap, and if it will work, I think it is one of the best fertilizers that can be used on a farm. It can be had at any point. Living in New Hampshire, I get mine from West Epping. It can be ordered and come by rail, and it comes very much cheaper than from the Massachusetts markets generally.

Mr. Hadwen. The important position which the potato holds in the market-garden, the kitchen-garden, and also as a farm crop, is apparent to all. I have heard described in the discussion the manner of growing, but not the most economical way of growing, the potato. There is a great deal of labor expended in the growing of the potato. It is a practice among farmers to spread their manure broadcast, and there is no doubt that that is the best practice that can be pursued. Dressing coming in immediate contact with the potato, has been found for many years injurious. The better way is to spread the dressing and plough it in, and then to plough it out, or plough the second time, and incorporate the dressing with the soil. Then make your furrows, and drop the potatoes in the furrows, some ten inches apart, and cover with the plough. That is the cheapest way to plant potatoes that I have ever pursued. That leaves the ground in a very uneven condition, where the potato is covered with the plough, and when the first crop of weeds comes forward, the best way is to cross that ground with a harrow, which brings it into a level condition, and breaks up the immense crop of weeds which is about that time starting into growth. Those of you who have not pursued that course will find that that is more than equal to one hoeing. Then my practice has been to go through the rows with the cultivator and to keep the

ground entirely level. I have never hilled my potatoes at all. The consequence is, that I get good crops of large, merchantable potatoes, and very few small ones.

Mr. Saltonstall, of Newton. The cultivation of the potato is one of the most interesting subjects to the farmer, as it is to the "doctors and scientific men," just alluded to, and to the men of no science who dabble with farming; men who have a love for the land, and like to live in the country. I am one of the latter. It is a subject of great interest to all, and I have listened with the greatest pleasure to what has been said. I have had great luck with the cultivation of this crop, and therefore my experience may be of some value. I have very few things to say, and will say them in the briefest words.

In the first place, I think it is of the greatest consequence that the seed should come from a distance, and, if possible, from a district where the rot and kindred diseases have never been known. My seed is always brought from Maine, and is always fair and of even size. In the next place, I think it is very important that only one eye should be planted by itself. I do not plant in hills, but in drills, and am very careful that the potato shall be so cut that one eye shall be cut out fairly, and only one. I think the result has always showed the wisdom of that course. In the next place, the ground should be thoroughly pulverized for that as for every crop. The manure is dropped in the drill. The land should be in such a state of cultivation that the seed can be covered with the plough, which is a great saving of trouble. Then, when the potato shows itself above ground two or three inches, I send the plough along the rows, and turn the earth from the potato on the sunny side of the drill. That, I think, is very important; it allows the heat of the sun to get into the roots, and it destroys the weeds that are growing at the same time. That is better than any other course I have ever adopted. After the potatoes have obtained sufficient strength,—I cannot say the exact height, I judge by my eye,—the plough is used again and throws the earth back upon the row, and, returning, throws it upon the other side. I seldom use the cultivator, but the plough, for the potato. I must say that I take no credit to myself for this mode of cultivation, because I learned it from the Irish. We all know that the Irish have excellent

judgment in the matter of potatoes. They know how to dig them. I never had a Yankee who could dig potatoes with a hoe as an Irishman will with a spade. It is a very pretty sight to see two or three of them go through a potato-field with their spades, digging the potatoes, and throwing them, even the smallest, in a clean row; levelling the ground; taking up every weed and every bit of witch-grass, and throwing all that is foul in the land on the surface. The field is thus left in a beautiful condition. You pick up your fine potatoes and put them by themselves, and the small potatoes are taken up afterwards for the stock. Then you can go over the land, raking the witch-grass and weeds into heaps, and have them taken up and carried off, leaving nothing on the land to prevent its easy culture the next spring.

There is one point which I hope will be referred to while we are on this subject; and that is, the sure approach of the Colorado beetle. I look upon it with dread, and feel sadly to think that, in connection with the other troubles which we have with the potato-crop, this pest is to visit our shores. I hope that before it reaches the eastern coast of Massachusetts, something besides that fatal poison, Paris green, will be found to stop and destroy the creature, and I hope that we shall have a discussion here which may throw light upon it while we are on this subject. I should like to know if there has been anything discovered by the farmers of New England, or of New York State, where this creature has committed its devastations, except Paris green, for its destruction; whether anything is being done; whether our Board of Agriculture has caused the subject to be investigated, because, I suppose, we may have the beetle here next year along the whole of our seaboard.

President Allen. I will merely state the mode of procedure which we follow in the State of Maine in raising potatoes. After the ground is well ploughed and in good condition, we take True's potato planter, which cuts and plants and covers the potato. It is so gauged that we can plant them at any distance apart. We gauge it so as to cut the potato as fine as we wish. It is generally gauged so as to cut a medium-sized potato into three pieces, and then it drops one of those pieces eighteen inches from the other in rows three

feet apart. It hills them slightly, or leaves the drill slightly raised. They are then treated with the cultivator after the weeds begin to spring up, and trimmed up by hand with the hoe.

Mr. Hadwen. I do not believe that I can either instruct or entertain this meeting with any remarks in regard to the growth of garden vegetables, it is so long since I have pursued the business of market-gardening; but I know very well the importance of beets, corn and squashes; I know they are important to the whole community.

As to the cultivation of beets, my course has been, in the first place, to take old and well cultivated land, free from stones and from anything that will obstruct the growth of the vegetable, and after giving it a good dressing, if I attempted to grow them on a large scale, I should grow them in rows twenty-two inches apart. That would enable me to pursue their after-cultivation with the horse, which of course would economize the labor of their production. In growing the beet, the seed should be soaked twenty-four or thirty-six hours previous to planting. That gives the seed the power of germinating and coming forward in advance of the weeds. It is very important in the growth of garden vegetables to have them come up and grow to sufficient size to hoe before the weeds come forward. Whoever lets the weeds get the start of any vegetable, gets into great difficulty and very great expense. There is no difficulty in the after-growth of the beet, if it is well manured and well cared for. The main point is in thinning, and thinning at the proper time. Thin about the time the beet is making its sixth leaf. That is of great importance. If thinned at the proper time, there is no check to the growth of the root. If delayed, they will lap over, and there is a loss. Nobody who grows beets, or any vegetable, can afford the loss of the crop in any season.

In the cultivation of squashes, which we know is a very important and desirable vegetable, my manner is to take sward ground (if you choose, you may take ground that has had one crop the previous season), plough in a good dressing of manure, make the rows eight feet apart each way, dig out holes sufficient to hold three good shovelfuls of well decomposed and rotted manure, and put it into those holes. Then

I drop in seed enough to give the bugs an opportunity to take a part and leave sufficient remaining for the crop, which should be about three plants in a hill. By pursuing this course, if your ground has been well prepared, if your manure is of the right kind, and the season is favorable, you will get a good crop of squashes.

Mr. Paul. At what time would you plant for winter squashes?

Mr. Hadwen. About the tenth of June, in our climate, for winter squashes, so that when they come up there will be no check.

Question. Are you troubled with the maggot?

Mr. Hadwen. I have never been troubled with the maggot, but I have been troubled with the black squash-bug, and also with the striped bug. The best way I have ever tried to destroy the black bug is to lay shingles on the hills at night. These black bugs will get underneath the shingles, and in the morning, if you take up the shingles, you will find the bugs on the under side, and you can take another shingle and give them a rub together, and that destroys them at once. The striped bug is very numerous after the squash has made its second or fourth leaf. The most effective way I have found to destroy them is to take air-slacked lime, put it into a dredging-box, and go along and dredge a little on each hill, when the dew is on in the morning, and the bugs will go to other places.

Mr. Paul. Do you put the seed directly on the manure?

Mr. Hadwen. I do. The manure is well rotted and decomposed, so that it will be in just the right state for the roots to take hold of it.

Mr. Warner, of Sunderland. In growing squashes, I find that the first requisite, and the most important thing to do, is to procure good seed. I do not believe there is one farmer in forty in Massachusetts who has had a decent garden the past season; and there is no farmer, or no person who knows, unless by experience, how much value he can gather from a small spot of land. I gathered, this year, from a piece less than four rods long and two rods wide, over forty dollars' worth of vegetables, including squashes, corn, tomatoes, cucumbers, cabbages and turnips. Mr. Hadwen says, put

three shovelfuls of manure, that has been thoroughly rotted, into a hill, and drop the seed on the manure. The best squashes that I have ever seen were grown upon a large heap of manure that had been thoroughly pulverized. Last season, in our town, a man grew two hundred and forty-six pounds of Marblehead squashes from one vine, which came up in his tobacco-bed. Two hundred pounds of those squashes were in good condition, well-ripened, and would average twelve pounds apiece. That shows, to my mind, that the land wants to be rich, and the manure wants to be well pulverized.

I can grow almost every kind of vegetable, except pease. Pease I cannot grow. Beans, whenever I plant them, I know nearly what I am going to get. The most profitable bean, and the hardest bean to grow of any, is the Lima bean. I have never had a failure, and never expect to have; but I am sure to get good seed. I never save a seed from any squashes which I grow for the next year. You will hear some farmers say that they have planted squashes for the last ten or fifteen years, and they have gathered their squash-seeds and saved them. The result is, they have a kind of pumpkin,—a little Boston squash, a little Turban, and a little Hubbard mixed together. It is not as good as a nice, sweet pumpkin. Be sure that you get pure seed, and you will have good squashes.

The question has been asked, what to do with the maggot. I have been troubled with it for the last three or four years. The last season I applied tobacco. I left in my hills some four or five plants, calculating that the maggot would eat at least half of those, and perhaps more; but I found that almost all my plants lived, and afterwards I had to go around and trim out the vines. I had no trouble whatever from the maggot this year. I applied the tobacco very freely.

Question. Please state the manner of applying it.

Mr. Warner. We grow tobacco with us to a considerable extent. I applied the leaf, which I gathered around the tobacco-vines, and then I took out of my store some fine-cut chewing-tobacco, and placed a little of it around every squash-plant, and every black bug that made its appearance was killed. They did not stay a great while upon my squashes. For the yellow bug, I applied plaster and black pepper,

sprinkling it upon the vines when they were wet. They never troubled me at all.

Question. What is your mode of raising Lima beans?

Mr. Warner. Well, sir, I generally take every bean and place it in the ground with my fingers, with the eye down. I generally put in two layers. If the season is wet, they are sure to rot, and if there is a dry time they are sure not to come up. So that I put one layer a little lower than the other, and I am sure to hit it.

Question. How do you manure them?

Mr. Warner. With thoroughly rotted manure, and then I apply some fertilizer also. I have applied the Boston fertilizer with good effect, and it has done well with me on potatoes; and wherever I have tried it, the result has been good.

Mr. Cotting, of Hudson. In respect to rust or scab upon the potato, I have heard it said this afternoon that if the potatoes are dug when they are green, you will not find any scab or rust upon them. Last spring I had considerable leisure, and with my own hands I planted and cultivated a certain piece of ground in four different lots. That is, I divided it into four lots. The first lot I manured in the hill, putting one shovelful of well-rotted horse-manure in the hill, and planted the seed. The rows were forty-eight feet long. There were six rows of them. I planted two whole potatoes, about the size of a hen's egg, in each hill of those rows, and covered them. Then I planted the same extent of ground with the same number of hills, the same distance apart, using no manure whatever; but I covered them well with ashes. The next lot I planted with the same number of hills, using Reed's Compound,—a composition made by Mr. Reed, of Boston, said to prevent the potato-rot. I used no other manure on that lot. The next parcel of ground, with the same number of hills, I manured in the hill, and also put on Reed's Compound. The ground was hoed with the hoe. There was no plough put in; but I hoed it mornings before the sun was up very high, and kept the weeds out. I may have gone over it half a dozen times during the season. Now, I come to the result. In the first lot, where they were manured in the hill, I pulled one of the rows very early, and I found in that row a great many pota-

toes that were scabby. I waited a fortnight, and dug the next row, and I found them still more scabby. I dug at the same time the first row right through of the four lots, and when I came to the lot where I used Reed's Compound alone, I did not find a particle of rust, or any scab, or defect. When I came to the parcel where I used Reed's Compound and manure, there I found some scabby potatoes, but not so many as I did where the manure was used alone. I found more potatoes in the hills where I used the compost,—that is, the No. 1 lot. I found more pounds of potatoes to those rows than I did to either one of the others; but the best potatoes were where I used Reed's Compound alone.

In respect to the rot, at the last digging, I found among the potatoes, where I had manured in the hill with compost, about one-third of them rotten. In lot No. 2, I found some rotten ones, but few, however; and where there was no manure, I found some. Where I used Reed's Compound, I found not a particle of rot.

Now, in respect to squashes. In the same parcel of ground, I planted twenty-four hills with Boston squash. I took great care to get seeds from three different places. I got one lot of seeds from the farm where I was brought up, where they had very good success last year, and also the year before. I took two years' seeds and mixed them together, and the other seeds I got from two other places. I put rather more than three good shovelfuls of manure into each hill, covered it lightly, and then dropped the seeds and covered them. When they came up, I took a little dredging-box and dredged them every morning. I never saw a black bug or a striped bug about them, and I had the best lot of squashes I ever had. So much you are welcome to from my experience of this year.

Mr. Paul. What did you dredge with?

Mr. Cotting. After they came up, I dredged them every morning with Reed's Compound. I have used black pepper and plaster. I have used plaster alone, and have lost my squashes. I have generally made a loss of two crops out of three.

Adjourned to Thursday.

THIRD DAY.

The Board met at ten o'clock, and was called to order by Dr. Loring. Dr. Wakefield, of Monson, was elected Chairman for the day.

Hon. Leverett Saltonstall. I wish, before the regular proceedings of the morning, as there may be no other opportunity, to say a word which is of some consequence to the farmers of Massachusetts, in regard to the approaching Centennial. Having the honor to be a commissioner of Massachusetts, and also a member of this Board, I take advantage of my double position to do some Centennial work. It will take but a very few moments to say all I wish to. Among the important exhibits which ought to be made at the Centennial is an exhibit of the agricultural interests of Massachusetts. It is a matter of great importance to the State, of great concern to us, in point of state pride, as well as of patriotic feeling, that Massachusetts should be well represented. I know that the farmers of Massachusetts do not wish to see this great celebration of our nation's hundredth birthday pass without some manifestation on their part of their interest in it. It will be a celebration exceeding in grandeur anything of its kind that has ever occurred in the world, commemorating, as it does, an occasion which is, perhaps, the greatest epoch in history—the hundredth birthday of the Republic—proving that we, the people of the United States, are able to govern ourselves without the aid of princes or kings. Now, gentlemen, I come to this point—the agricultural exhibit of Massachusetts. We do not pretend that Massachusetts, as a State, can vie with the Western States, or with the Pacific States, in agricultural products; but we have certain valuable agricultural interests here. If not, why are we taking part in these proceedings? Why is the State maintaining a Board of Agriculture at some expense every year, if it is not for the purpose of advancing the agricultural interests of Massachusetts? Have we nothing to exhibit in Philadelphia? Are we going to permit the manufacturers, the mechanics and artisans of Massachusetts to

exhibit their work, and the agriculturists, the men who get their living by agriculture in Massachusetts, not to make any exhibit at all? It seems to me that this is all wrong. We can depend, of course, upon individual enterprise in the matter of exhibiting agricultural machinery. That takes care of itself. Every inventor, every manufacturer of those implements and of all the matters pertaining thereto, will take care of himself by making an exhibit there. There are already applications for space from a number of artisans of that class. In regard to the exhibition of cattle, too, every breeder will probably take care of himself; if he takes pride in being a breeder of Ayrshires, Jerseys or Shorthorns, he will want to maintain his reputation during the fortnight that that class is to be exhibited. If he is a breeder of horses, he will want to be represented during the fortnight that horses are to be exhibited. I do not consider that the state commission is bound to urge those to make an exhibition of their stock, though the commission will encourage, advise and afford all the facilities possible to the gentlemen who make exhibits in those departments. But, for the Commonwealth itself, there is an exhibit that ought to be made in one of the state departments; and that is, what the agriculture of Massachusetts consists in,—its dairy-farming, its market-gardening, and everything that we deal in as farmers in Massachusetts, ought to be represented,—so that by the side of those enormous displays of large crops from the prairie-lands of the West, we can make a neat, pretty, attractive exhibit of the different roots, grains, grasses, fruits, woods, and everything that concerns the interests of agriculture in Massachusetts. It should be presented in good taste, so that every one who passes by will say, "Well, after all, Massachusetts succeeds, not only in manufacturing cotton and wool, she not only devotes her energies to educating her people, but she reaps in her fields." By the side of the exhibit of our great educational department, which I hope will be as ample and as handsome as we can possibly make it, should be this agricultural presentation of Massachusetts.

Now, gentlemen, not to take up any more of the valuable time which is allotted to other purposes here, I hope I have excited your interest in this matter. The towns where you

live have all had a circular sent to them by the Massachusetts commission, urging them to make as valuable and interesting an exhibit as possible. I beg you, when you return to your homes, if you are selectmen, or have any influence with the selectmen of your town, to take hold of this matter, and push it forward. It will be the starting-point for all time, so that when the Centennial has passed, and years have gone by, the people of this State will look back to the historical collections illustrating your public buildings, the products of your farms, the laying out of your farms and highways, and everything else, as a starting-point, which we have not now, of what the country was a hundred years ago, and which posterity will most thankfully refer to should the work be properly done.

I hope that when this meeting dissolves every gentleman here will go home determined to do his share in adding to this very important exhibit of the agriculture of Massachusetts; that if he has it in his power to send any information to the commission, he will do so; if he has made any valuable experiments upon his farm, which are reliable, that he will return the statistics of those experiments, with illustrations of the crops which he has raised. If it is corn, let him send a sample of that corn. If it is a root-crop,—potatoes, beets, carrots, turnips, or anything else,—let him send samples of them. They shall be carefully preserved in alcohol, if necessary, or something else that will be sufficient to keep them throughout the summer. I am very anxious to make an elaborate and careful collection of all the grasses of Massachusetts, and shall be extremely thankful to gentlemen, if they have it in their power, should they furnish the commission with such specimens of that very important crop of Massachusetts,—the hay-crop.

Having made these remarks, gentlemen, as briefly as possible, I wish to urge upon all the importance of this exhibition; and I know that when you return to your homes, you will most gladly aid the commission in every way in your power; so that when you visit Philadelphia, as you all will, every one of you, with your wives and children, you will be able to point with pride to the agricultural exhibit of Massachusetts as an important and most interesting one. I

am very sorry to say that I have failed to elicit the earnest attention of the Agricultural College in this matter, although I have sought to do so. Col. Clark is an intimate friend of mine; the professors of the college are my friends; but, for some reason or other, my appeals to them to aid the commission in making this very important agricultural exhibit of the State have failed to meet with a response. I hope that the Board here will instruct its Secretary to aid the commission in every way in his power, and that they will take such action as will give their own individual attention to the commission.

Dr. Loring. It is not necessary for me to enlarge upon this question here, because the Board all know that I have been occupied for the last two or three years in endeavoring to organize and sustain the Centennial interest and spirit of Massachusetts. The movement in an agricultural direction I have long been cognizant of, and I am very glad that Col. Saltonstall has made this appeal here this morning. As a response to that appeal, I desire to offer the following motion:—

Voted, That the members of this Board cordially indorse the efforts made to secure a full representation of the agricultural industries of the Commonwealth, and pledge their individual influence to promote the objects of the commissioners.

I do this in a concise way, knowing that the time of the meeting is short, and that we have other business. I merely desire to present the matter, and do it in that form.

The motion of Dr. Loring was carried unanimously.

RESTORATION OF THE FORESTS.

BY GEORGE B. EMERSON, LL.D.

Mr. Chairman and Gentlemen of the Board:—We have a most important subject before us,—a subject which has been growing in importance, in my mind, ever since, more than forty years ago, I began to investigate it. The great question is, What can we do, each of us, all of us, to restore the

forests to the condition, or some approach to the condition, in which they were when this country was first settled? The whole of New England, the whole of Canada, all the Middle States, almost the whole slope towards the Atlantic, was covered, when our ancestors first came here, with great forests, —most of them the most magnificent forests in the whole world. Those forests have been gradually disappearing ever since; and it is known—it is as certain as any fact can be—that in fifteen years from this time, unless something is done to restore the forests, all the large forests in New England, all the forests in the British dominions on this continent, all the forests in America, will be cut down. Great pains have been taken to ascertain the amount of wood of every kind that is cut down and carried off every year; and a year ago, when I was in Washington, I said there was no sort of doubt that, in twelve years and a half, at the rate that the forests have been cut down for a great many years past, they would be all gone. I say now, gentlemen, that in eleven or twelve years, unless something can be done to retard that destruction, all the forests will be gone.

Now, gentlemen, I say that every one of you can do something to retard this ruin. No person in this country has the sole charge of the forests; but every man who has a farm has the charge, or may have the charge, of some portion of the forests. Every man, certainly every farmer, may do something to restore the forests. Why should the farmer do what belongs to the whole country? Why should he do anything to restore the forests on his own domain? I say, first, to make it more beautiful, more healthy and more pleasant; next, to make it more valuable. How can any man do anything to make the forest in his little domain more valuable? What can he do to make his home more pleasant? I do not know what any person living in the country can do better than to surround his home with the most beautiful trees. Gentlemen, we have the most beautiful trees in the world. I went to Europe three or four years ago for the purpose of studying the forests there, and to see what was doing, and I found that there are more valuable trees in the forests of Massachusetts, growing naturally,—I said so a great many years ago, and I found by inspection that it was true,—than in any part

of Middle or Northern Europe,—many more. Many of these are among the most beautiful and valuable trees in the world. A man can do nothing for the improvement of his home so cheaply as to plant around his house, at a proper distance, the best and finest trees. What are the best? Every person must be the judge of that. I think, taking all things into consideration, the sugar-maple is the finest and the most valuable tree that a man can plant on his domain. The sugar-maple is, perhaps, the most beautiful tree while it is young, and it grows more and more beautiful with age. It grows to a magnificent height, and it has the advantage of being very unlike all others. I pass very often, in the summer, over a road, by the side of which there is a row of fifty or sixty sugar-maples. They are changing every day. In the autumn they assume the richest colors; and, what is remarkable,—what is not true of any other tree that I know of,—every individual tree has its own colors. You cannot find two out of the sixty on that road, quite alike. All of them have patches of the same colors, a few of the richest colors, but no two are alike. Now, variety is one of the elements of beauty. If you want the greatest possible variety of beauty in your trees, plant rock-maples. Not about your house; plant them along the road; plant them along avenues; anywhere. They will grow larger and grander and more beautiful for forty years; and, before that time, they will begin to be pecuniarily valuable, so that every tree will yield from three or four gallons to a barrel of sugar-making juice. They will be a perpetual benefit, and of perpetual value.

As to the trees that you plant near your house to make it more healthy and pleasant, I think that one of the very best is the beech. And the reason is, that it is a perfectly clean tree. It has a clean stem, none is finer, a beautiful bark, and no bushes flourish under it; it keeps everything off. It is clean, exquisitely clean. I saw in England, near the house of a friend, three noble beeches, and the European beech is so much like ours, that while they are young, they are not easily distinguished. It is only by examining their leaves closely that one can see the difference; and I told him that they made his house to me more pleasant than any other house I had seen. And it was so, and they constantly felt it to be so.

There are many other trees of great beauty. Such are all the oaks, but they are not very desirable to have near one's house. They must be planted at some distance, where they may have ample space. All the birches are beautiful. We have four or five of them among the finest trees of the world. You have one growing on the banks of your charming Merrimack, that I never found in Massachusetts except on the banks of that river or its tributaries,—the red birch. It is an ordinary, often a shabby looking, tree, as you see it on the banks, but, carefully cultivated, it makes one of the most graceful trees I have ever seen. I saw one not long ago, and stopped to look at it, it was so attractive. Usually, it is found only near water, but that one was growing, perfectly well, miles away from any stream or collection of water, and was perfectly healthy.

There are multitudes of trees, any one of which you will find an ornament to your house. A single tree growing near a house gives a beauty and appearance of comfort that nothing else can. Go into the country and find a house standing by itself, without anything about it, and you pity the owner, especially on such a cold, bleak day as this, obliged to dwell in such a bare, unprotected home!

Now, I say, gentlemen, for yourselves and for your neighbors, see to the planting, at proper distances from your house, of some of those most beautiful trees,—beeches, ashes, maples, oaks, tupelos, hickories, buttonwoods. Very near the house, I would not have any of the pines; but at a distance, as many as you please, and I would have a mixture of pines and the other trees. Here is a remarkable fact, which is now perfectly well known, and yet many people are not aware of it. Most of our forest-trees flourish better when there are other trees, very widely differing in character, mixed with them. Why should it be so? Why should a forest of oaks flourish better because pines are mixed with them, or a forest of maples? It is difficult to say, but probably the reason is that the food of each tree is, in some measure, peculiar to it. All the trees have to gather from the soil certain elements, and each tree needs some elements which no other tree wants. If, therefore, you want to husband all the resources of your soil, you must have a consider-

able variety of trees. How shall you create them? Plant them, gentlemen. I doubt very much whether there is a farmer in Massachusetts (I really have never seen one) who has not one or more acres of land under cultivation which it is a waste of time and money and manure to cultivate. Why not take such a piece of land, of one acre or several, and devote it to forest? Plant all kinds of trees that will grow in it,—pines will grow everywhere,—the maples, the ashes, the beeches, the hickories. The hickory is one of the finest trees, the cultivation of which it is desirable on every account to encourage. Why not devote these acres, which are now of very little value probably, or no value at all,—why not devote them to trees? Find out how to plant the different kinds of trees; find out what are the most valuable. I have mentioned some of them. The hickory, for all purposes, is one of the most valuable trees that grow. It is extremely beautiful. Of course it is not necessary to say anything about their growth; everybody knows how well they grow. We have three pines growing naturally in Massachusetts,—the white pine, the pitch-pine, and the red, or Norway, pine. Wherever the pitch-pine grows,—and its prings up everywhere,—the white pine and the red pine, and the very valuable European pine,—Scotch fir, they call it in England,—will flourish. They are not so readily diffused; they do not plant themselves so surely as the pitch-pine; but wherever the pitch-pine flourishes, better pines will flourish too, and not only pines, but the firs, spruces, cedars, and the richest and most ornamental of the pines,—the hemlock.

I say that any one of you may add to the value of his farm by taking those poor lots, which are cultivated to disadvantage, and planting them with trees of every kind, or such kinds as he finds in the neighborhood. Wherever one of the oaks will grow, all the other oaks will grow. Wherever the pignut or bitternut hickory grows, the mockernut and the shagbark will grow just as well. All the hickories, as I said, are extremely beautiful trees, and they are peculiar to this country. When Prof. Agassiz came to this country, some time ago, he called on me, because, he said, he wanted to find a person who could point out to him the hickories, for there were no such trees in Europe. There had been, some

hundreds of thousands of years ago, various kinds of hickory on what became the Jura Mountains, for in the quarries of those mountains the leaves and fruit of the tree had been found, but since the historical period had begun, the hickory had not been found in Europe. Here we have four species, perfectly well characterized, and all of them very beautiful trees. I showed him all of them, and pointed out the differences. He recognized with delight the characters of all.

I could easily enlarge upon this subject, but there are other things about which I wish to speak. I say that by planting your own fields with trees, you not only make your homes more pleasant, but you make them healthier, and you make your own domain more valuable. Here, gentlemen, is a fact which every individual ought to know. It is a most important fact in the relations of the vegetable world to mankind. Every tree is a purifier of the atmosphere. There are on the leaves of every tree literally millions of little openings, large enough for the particles of air to enter, and into which they do enter. When a breeze passes over a forest, or over a single tree, the particles of air enter these little openings in the leaves, and there the leaves part with their carbonic acid, which is so unwholesome to breathe; they part with their nitrogen, and with everything else, really, which is not perfectly wholesome, and they pour into the air pure oxygen. The forest thus completely purifies the air that blows through it; it takes from it everything that is poisonous or even injurious to man, and throws out to us pure oxygen, or that mixture of oxygen which is best for us to breathe. I say, gentlemen, that this fact ought to be generally known, because it is a fact of vast importance. It has not been long known; and I have visited places where the recent knowledge of that fact has done a great deal of good. There are regions in Italy which anciently were very wholesome and pleasant places to live in, but which, for the last one or two hundred years, have been growing more and more unhealthy, until, a few years ago, they were considered pestiferous and unsafe for anybody to live in, and those who dwelt there took care to go away at certain seasons of the year. This was in a part of Italy nearest the sea, which is thence called Maremma. Within a few years, trees have been planted in various places

in that region, and the effect has been to restore the original purity of the atmosphere. Large forests have been planted in some places, and the region has in consequence become perfectly healthy, so that the ancient towns and villages which had been deserted are again repeopled. The same thing has been found in various other parts of Europe, and also in this country. In Washington, a gentleman who had paid some attention to this subject, said: "Here is a region which the soldiery have occupied, and found very unhealthy. If you will give me leave, I will plant it with sunflowers." He planted a great number, several rows, and the effect was immediate. The very next season, that region, protected by the sunflowers, became healthy. The sunflowers have been continued, or something else put in their places—trees and plants of various kinds; and that region is now one of the most healthy in Washington. The lives of hundreds of our soldiers and others who are obliged to live in Washington, have undoubtedly been saved by that device of the sunflowers. So, I say, you may render every farm in Massachusetts more healthy, as well as more pleasant, by planting trees.

There is another thing. I have no doubt that many of you, gentlemen, are aware of cases where streams which, in your early boyhood, were large and constant, have dried up. In my native town, two little streams at a distance of two or three miles from the sea, passed directly across the road along which I often went to see some of my relatives, and over which I went on my way to college. Those streams, when I first knew them, ran throughout the year; on both of them there were mills,—on one a saw and a grist mill; on the other a saw-mill, with good substantial dams. These mills were serviceable throughout the year,—even in July and August. Year after year I saw these streams becoming smaller and smaller, as the forests about their sources and on their banks were cut away. The water, which had originally flowed equally every day in the year, came down in a great torrent in the spring, and in midsummer almost ceased to run. The last time I passed by, the mills had been long carried away, even the ruins of the mills and of every thing about them were gone, and the two beautiful streams which I had seen flowing so charmingly for so many years, had

become, one of them a little trickling rill, which I could step across, and the other a series of mud-holes. The difficulty was, that the forests, the sources of those streams, had been cut down. The rain which falls in a forest penetrates the earth, which, protected by the roots of the trees, keeps a portion of it there for the whole year. Thus in a forest the water is laid up, kept as though it were a treasure, and it continues to trickle away from that forest every day in the year. Cut down the trees, and all the rain that falls in the spring, all the water that is produced by the melting of the snow of winter, pours down in great floods. It was the great floods that carried away those mills and those dams. They all come down at once, and there is nothing left. But that is not the only loss. Where the trees have been cut down, the leaves, and that substance made of leaves, the most valuable of manures, are dried up, and the first flood carries this off; next after that, the earth that has been formed by the leaves; and after that is gone, the fine sand; then the coarse sand. Having watched the operation of these causes in our little rivers, I went to Europe some years ago, for the purpose of studying that among other things; and I found, in the south of France and the north of Italy, hundreds of thousands of acres where exactly this process had taken place. A poor man living on the branch of the Po, for example (and this process had been going on longer and more terribly on the Po than any other river known), having a little farm, and wanting some wood to burn, or to send to market, cuts down his trees.

Apparently, he has done no harm; but the winter's snow and the spring rains come, and as I have said, the leaves having been dried up, the next rains carry their substance away, and gradually the increasing torrents carry heavier and heavier substances, until, at last, on the steep sides of hills, they carry off great stones. This destruction has been going on for hundreds of years in the valley of the Po. The Po, when first spoken of in history, was a charming river from its innumerable sources in the Alps on the north side, and the Appenines on the south side; one of the most charming rivers in the world, and a blessing to all who dwelt on its banks. Its channel is now filled up. It has extended its

mouth several miles into the sea, by the earth, stones, and ruins that have been carried along; it has made a wall on each side, so that now there are miles and miles of its course where its bed is literally higher than the neighboring grounds. Sometimes this wall gives way, and the farms on one side or the other, or both, are overwhelmed. It was only last year that one of these terrible accidents occurred on the river, and ten thousand people were made beggars. Their little farms, which they had been cultivating by the side of the Po, were overwhelmed by the overflowing of the river, and will never be cultivated again. In France, I saw what was being done, more satisfactorily than anywhere else. The great rivers of France have been acting in the same way. None of them are so large, or so long, at least not so long from the mountains, and therefore, the overflows have not been so terrible; but thousands of acres, in the south-east of France, have been carried away, year after year, by the causes I have pointed out. Sometimes a whole village will be carried away at once; the soil, and everything that kept the earth in its place, carried away by a great deluge. Thousands of acres are sometimes swept away at once. Agents of the government are taking the most efficacious measures to remedy this evil; and so important do they consider it in all the countries of Europe, that there are forest schools now, which I visited in Italy, France and Germany, where young men are educated, after they have been through the other schools, to take care of the forests, for the forests, in every country of Europe, are a national concern. It is not done in Great Britain, because every gentleman is a lover of trees, and takes the best measures possible to keep them in good condition, and, if possible, to make them better. Go through all the countries of Europe, and you will find that the greatest pains are taken to remedy the evil that has already been done, and to prevent its recurrence in other cases. Now, I say, gentlemen, every one of you can do something to prevent this evil. You can do something to have the hills in your neighborhood planted to the summit with trees. That will remedy it entirely. You all know, undoubtedly, what has been done in that direction by one of your neighbors over here in Byfield. I went to see him a few weeks ago. He

has taken for his experiment a hill of twenty-five acres, the top of which is higher than any of the land in the neighborhood. Undoubtedly, you can see that hill in Byfield from here. It was a bare hill from top to bottom. He has covered it with trees from the bottom to the top, and has done a thing on the top which I was surprised and delighted to see. He had planted it with various trees that he wanted to grow there, but they could not grow. The question then was, What should he do? He got pine trees from abroad, and from the north, and the hardiest of them, those that will grow anywhere, he planted there: pines, spruces and hemlocks, which will grow anywhere. He planted them, and when they had made a good growth, he put down close by the side of each, under its shelter, an oak or a hickory, or a maple, and that oak, or hickory, or maple flourished perfectly under the protection of the pines. I would advise every one of you who has not been there, to go and see what a beautiful work has been done. I say such a good work has not been done to my knowledge anywhere else in Massachusetts.

Now, I repeat, it is very important to cover all the hills with trees. By doing it you will improve the climate. The loss of trees in Massachusetts has injured the climate very much. It has been growing worse and worse for over a hundred years. I was told by an old gentleman in Worcester, forty years ago: "There are a great many plants we cannot cultivate in our gardens now,—nice, delicate things,—which, when I was a boy (he was fifty or sixty years old then), grew perfectly well; but, since then, all these hills have been denuded, the forests on them have been cut down, and the winds from every quarter come in without being impeded at all, and that makes our climate so bad here in the centre of Worcester that many of the delicate plants which flourished perfectly well thirty or forty years ago cannot be raised now."

Gentlemen, you can all do something towards remedying this evil. Take care that the tops and the sides of all the hills shall be covered with forests. By so doing, you are not only protecting your own gardens so that you may cultivate delicate plants in them, but you are rendering your homes more comfortable and more healthy. The great difficulties

with us, in our climate,—every one of you feels it on such a day as to-day, and in the hottest days in summer,—the great difficulties are the excessive cold and the excessive heat. The more we can do to cover the hills with trees, the more we do to diminish that excessiveness of the climate. On such a day as day before yesterday, if you had a great hill directly north-west of you, covered with trees, the wind would have been less violent in every street in this pleasant town; and so it will always be. You cannot cover a hill with trees without diminishing the violence of the winds that sweep over it.

I do not know, gentlemen, that I need say anything more to you. These are among the things that I wanted to say. I wish you would take an interest in this matter. It is of very great importance. It is really of national importance. I went last year, as I told you, to Washington, to see what could be done. I have been studying this subject for many years, and know something of the evil and the remedy. I wanted the general government to do something for the protection of the forests and for the prevention of this enormous evil. I studied it out, and came to the conclusion, as I have stated to you, that in ten or twelve years the forests on the Atlantic slope would be cut down, unless something was done. I went to the leading men in Washington; I went to the President. He said it was a most important subject; he was very much obliged to me for coming there, for no private object, but for a public improvement of that kind. I went, as I have said, to all the leading men, and they all expressed themselves in the same way. The President did exactly what I asked him to do. He said he approved of my memorial, and would act upon it immediately. That was Friday morning. On the next Monday, he sent in the memorial, and requested that it should be referred to a committee. Everybody to whom I spoke on the subject did everything I asked them to do. They said it was a very important question; that I deserved the thanks of the community for calling attention to it; but nothing was done. It was referred to a committee, and the committee found that it would cost eight thousand or ten thousand dollars a year to have a man to take charge of the whole matter, go everywhere, and find out about it; and

to save that eight thousand a year they declined, or at any rate, failed, to do anything. Thousands and millions of dollars were at that time squandered for the support of men who were doing nothing.

Now, gentlemen, you can do, every one of you, a great deal about this. I say you can not only render your farms more pleasant and more healthy, but you can render them more valuable. If anybody wants to know how to manage the forest-trees, I can give him suggestions. If there is any question that any gentlemen would like to have answered, I shall be glad, as far as I can, to answer it.

Question. I should like to ask if we have had less rain since the forests were cut down? I have seen statistics of the rainfall in the last two years, and if I recollect right, it was stated that, in two storms last year, more water fell than during the whole year before. Out in California, where they formerly had no rain, since they have been cutting down those large trees, they are beginning to have rains.

Mr. Emerson. Some of those facts are overstated; but I have no doubt that, in a period of twenty years, about the same amount of rain falls, whatever the condition of the forests. But here is the question: Will you let that rain pass off and fall into the sea, or upon the plains, or will you arrest some of it, and make it fall upon your land? This you can do by preserving the trees that still remain, and planting others where they have been cut off. Trees are electrical; they draw off the electricity, and they bring down a portion of the rain. They stop the clouds that are going over, and make them discharge a portion of their water. I believe that the gentleman is right in saying that there is as much rain in a series of years, in the same section of country, irrespective of the forests; but this I am sure of, that you may stop some of it, if you take pains to do so, and make it produce a good effect.

Question. I should like to ask whether you consider it healthy to have trees so near a dwelling-house that they shade it?

Mr. Emerson. I am very glad that you have asked me that question. That is a very important subject. I say that

the most precious thing to a house is sunshine, and no tree ought ever to be planted so near a house as to diminish the sunshine upon that house. Plant your trees, but at such a distance that the house shall never be thrown into the shade. The air, on the whole, will be purer around a house if there are no trees close by; but, then, you must have trees at a little distance to purify the air, if you want to be sure of having it pure. I say no tree ought to diminish the sunshine on a house. The sunshine, in our cold climate, is the most valuable thing we have. Sometimes we get it in larger doses than we want; but it is the most blessed thing in the world, and we ought never to allow the sunshine to be taken away from our houses at any season of the year. From the sun's rays come directly ingredients which are essential to the perfect growth of plants. Plant trees, as many as you can,—the more, and the more beautiful, the better,—but not too near your homes.

There is one point that I wanted to insist upon, which I forgot. In our pastures, there ought to be trees; not single trees only, but little groups of trees, so that the cattle can go there in the heat of the day and cool themselves, and keep, as long as they please, away from the sunshine. The sunshine is as important to them as to us; but they are incommoded and injured as much by the excessive heat, in July and August, as we are. They ought always to be protected. The best kinds of trees that you can get for that purpose are those which have the most leaves. Here is one fact, gentlemen, which I do not know that you will be pleased to learn, but it is a fact. I have been planting trees now for the last twenty years, and over, and I have planted the best European trees side by side with American trees, of the same kinds, and watched the difference.

There is one very remarkable difference. The European trees, of the same kind, have a great deal more foliage, and they hold their foliage much longer. I have been watching for the last forty years the elms on Boston Common. There are a few European elms there, and the leaves of those "English elms," as they are called, are six weeks longer on the trees than the leaves of the American elms around them. That is really a very important thing—to add to the shade of

summer six weeks, and to retain for that time the beauty of the forests. I find that that is true of nearly all the trees. I find one other thing, which I ought to state, which may be interesting to some of you. I have planted European trees upon one of the poorest lots of land that I know of, down close by the ocean; one of those promontories that run into Boston Bay; poor as poor can be. I have planted all the European trees, side by side with our American trees, and I have found, in every instance except one, that the European trees grow better and more rapidly than the American. Take the English oak. I have every variety of the English oak,—twenty or more trees; and all of them are growing better than the hardiest of our oaks, even the red oak, which is the finest and quickest grower. So it is with the beech; so it is with the ash, most preëminently. There is one exception,—it is not apparently an exception, though it is really an exception,—the European birch, which they consider the most beautiful tree in Europe; and it is. Our little gray, commonly called white birch, which grows everywhere here, is so like it that I cannot tell them apart at the distance of fifteen feet; that is, until they get to some height. Our little birch never grows to any considerable height, but I have several of those European birches that have grown fifty or sixty feet high within the last twenty-three years. Our largest birch, the canoe-birch, grows very rapidly,—certainly quite as rapidly as the European birch. It does not grow so large at the stem, but it keeps up its size very much higher, so that, when they are of just about the same height, if you cut them off at ten feet from the ground, the diameter would be greater in the European than in the American; but if you cut them off at thirty feet from the ground, it would be greater in the American. So it is with the maples. They have two maples in England of great value, and only two. I have them growing perfectly well. They grow a great deal better, I am sorry to say (I do not know why), than our corresponding trees. In the place which I chose, I say because it is so bad a place, because it is so unfavorable to the growth of trees that I might give them all the disadvantages possible, the rock-maple would not grow; I could not persuade it to grow; it refused to grow in such poor land; but the English

maples grew a great deal better than any of the maples of our country, except the white maple. The English elm grows better than the American elm, and it has a great deal more foliage. So it is with all the others. It is almost universally true that the European trees have a great deal more foliage, cast a very much deeper shade, and hold their leaves a great deal longer, bringing them out earlier in the spring and holding them much longer in the autumn, than our American trees.

Mr. Brown. I look upon this subject as a very important and interesting one. I was querying which is the best way of propagating these various kinds of trees, whether by transplanting, or whether any of them can be raised from seed—the sugar-maple, for instance. I think a few hints in that regard will be interesting and instructive.

Mr. Emerson. I shall be very glad to speak about that. In the first place, I say that every one of our native trees may be propagated by seed. I have tried so many of them that I have no hesitation in saying that every one of our native trees may be propagated with perfect certainty, if you only know how to take care of them. A tree speaks for itself, generally, as to the time the seed should be planted. When a seed falls to the ground, it falls to produce another tree. When, therefore, the seeds are ripe and fall to the ground, that is the time to sow them. As to the mode of sowing them, you can sow them in the field, just as you do a crop of corn, taking care not to cover them too deep, and taking care to have them protected. I have heard of a man (and I was very sorry not to go and see him) who had sown a quantity of seeds in a field of rye, and the rye protected those little trees that sprang up perfectly, and the owner let the rye stay till the next spring, to protect them. Here is a hint that the trees give us of how they ought to be planted. The oak-tree lets its acorns fall on the ground, and there they take root. The same thing is true of almost all our trees; not all; they grow best under their mother's care, under her protection. In Germany I went to a great forest school, thirty miles from Berlin, and the superintendent carried me around and showed me how they planted their oaks. I found a magnificent forest of several hundred acres that has been given up to this

forest school, that the young men may have an opportunity to study the tree in every position and in every condition. I found the place that he had selected to plant oaks was a little opening among oak trees,—a noble forest, with high trees on every side. The seed is planted in this spot, where the trees protect them from the sun, except for half an hour or an hour in the hottest part of the day; they are partially protected almost the whole time. That is a matter of very great importance, very much greater than it is commonly considered. If you are going to plant seeds, the fruit of trees, in a place which is not protected, it will be always advisable to have a hedge or a fence built up between them and the sun, so that they shall not be exposed to the full heat of summer.

These are the most important things that I have to say in regard to that. I could talk longer if you were willing to listen, because this is a matter in which I feel the greatest interest—which I have felt for many years.

Col. Saltonstall. Would you not advise the obtaining of small trees from nurseries, where the planting is not to be done on a very large scale, as a matter of economy?

Mr. Emerson. Certainly I would. Plant the trees in your nurseries. But this essential thing has commonly been disregarded in many nurseries,—that the plant, when it comes up, should be very much protected from the sun.

Mr. Wetherell. It is often said that the leaves are colored by the frost. Is that true?

Mr. Emerson. That is a matter I have been observing for forty years or more. The only effect of the frost upon all leaves is to injure very much, and presently destroy, their beauty. The frost never produces the beauty of any leaf. It is something else. I cannot tell why the trees of Massachusetts are incomparably more beautiful in the fall of the year than the trees of Europe. It is something in our soil, or in our atmosphere, which produces that change. The frost has nothing to do with it, except that when the frost comes, it puts an end to all the beauty of the trees.

Question. I would like to know the best method of transplanting trees.

Mr. Emerson. One thing is essential. Do not transplant any tree, except a pine, as long as the leaves are on it. Then

I think it is very important, in transplanting a tree, to take great pains in taking it up. Dig a hole all around it, so as not to cut off the ends of the little radicles; these are the things that give life to the tree; it is not the great roots. The great roots merely support these little radicles, and send them out. Take care to dig the hole so far from the trunk of the tree that you may preserve all these little radicles. Then take up as large a body of earth as you can, to keep the little rootlets together.

Col. Saltonstall. Perhaps my experience in transplanting will give an answer to the question which has been asked. As you know, sir, I have transplanted a great many trees.

Mr. Emerson. Yes, sir; and I know with what perfect success.

Col. Saltonstall. I took a hillside, without a tree upon it, except a few old apple-trees. I not only transplanted trees from the forest, but I imported from England, seventeen years ago, at a cost of two cents apiece, a large number of trees, American as well as European. They were little things, a few inches high. I put them in a nursery, not larger than that platform. My hillside is now almost a forest. I cut down every year firewood enough for consumption in my open fireplace, in the necessary thinning out of those trees. I have transplanted trees at all seasons,—winter, summer, autumn and spring.

Mr. Emerson. Could you transplant trees with large leaves in summer?

Col. Saltonstall. A tree cannot be transplanted with the leaves upon it, unless it has been transplanted at the proper season for three successive years. The main roots having been trimmed closely, and the tap-root having been removed, it will have a mass of little roots, like a plant in a flower-pot. I have transplanted hickories with success,—perhaps the most difficult of any of our forest trees to transplant. It is a very sensitive tree, and makes very few radicle roots. It sends down a strong, sturdy tap-root, so that, unless it has been taken very young from the forest, and this tap-root taken off, and is transplanted at the proper time, I think it is impossible to transplant it successfully. I have gone into the woods on the other side of my hill, where they

grow in abundance, and taken up the little trees, two years old, with the greatest care, taken off the tap-root, and placed them in the positions where I wished them to grow, where they were protected by other trees around them or by artificial protection, and they grew beautifully. If you cut off the tap-root, and let the tree stand for a couple of years, you can remove it, and it will grow better, perhaps, than if left in its native forest, and you can remove it with perfect safety and success to any part of your grounds. It seldom fails, if removed at the right time and with proper care, and makes one of the most beautiful trees.

There are one or two other matters in which I have had a great deal of experience. I must differ from Mr. Emerson in regard to one, and that is with respect to European and native trees. I imported, as I say, a large number of European trees, and planted them. It may be that location makes a difference, but I am strongly of the opinion that it is dangerous to plant European trees instead of American. If one wishes to have a variety of trees about his place, by all means let him plant European trees. I agree with what Mr. Emerson says in regard to the beauty of their foliage as compared with ours; but when he plants a European tree, let him plant an American tree of the same kind sufficiently near to take the place of the other. The late Peter C. Brooks, I have been informed, imported a large number of English oaks, or planted them from the seed, in his grounds, and they grew to large size and great beauty. They were in as beautiful a place as could be; but all of a sudden, in one or two years, every one of them, which were large and splendid trees, died, for no apparent reason.

Now, in regard to other foreign trees. Mr. George W. Lyman has upon his place a magnificent old English elm, planted by his father. By the side of it he has a superb American elm, planted at the same time, and very likely for the purpose of making that experiment, by old Mr. Lyman. They grew there for perhaps three-quarters of a century with equal beauty, the American and the English,—two beautiful trees. But if you go there to-day, you will see that the American elm is in perfect condition, while the English elm has lost much of its head.

Almost everybody in our country is planting the Norway spruce, and giving up our beautiful native spruces,—our black and white spruces, the most beautiful trees of their kind, I think, in the world. The Norway spruces grow, some of them, very handsomely, and especially so until they are twenty years old. They are objects of great beauty. They seem to grow faster than the American. But I go and look every day at my American spruces, creeping along surely and beautifully, with smaller foliage, it is true, than the foreign trees, but in their form I think they are more beautiful. There is a native spruce in Mr. Lee's grounds, near me, which I will venture to say is a more beautiful tree than any Norway spruce you ever saw. These Norway spruces often die after a time, from no cause, so far as can be seen, not being in exposed positions, but standing just as the others do. They fade out; they begin to lose their foliage and dry up at the ends, make a great many cones (which is always a sign of premature death), and finally die.

So with the English elms on my own place. I have a large number of English elms, which I most unfortunately planted upon my avenue, at regular intervals, and depended upon them for my permanent trees, to be objects of beauty to me and the generations after me. These trees have their foliage upon them, as Mr. Emerson says, five or six weeks longer than the American elms, but I have lost two of the finest of them; they died for no reason, that I could discover; and if you look at the others, they present more or less the appearance of our buttonwoods at the present day in our forests, of decaying at the ends. Here and there you find dead twigs and occasionally a whole limb on every tree that is affected.

I am very earnest about this fashion of importing and buying at nurseries foreign trees, in preference to our own beautiful trees. The red pine of Maine, to which reference has been made, is more beautiful than the Austrian pine,—far more beautiful. It is of the same color and habit, only it has longer spines, and it is a more beautiful and surer tree to plant. Our own hemlock is the most beautiful evergreen in existence, and our own spruces, as I said before, I think can be better depended on, in the long run, than the Norway spruce.

In regard to maples, there is one marked exception to the general rule respecting foreign trees. The Norway maple, I believe, is a perfectly hardy and sure grower, and it is as beautiful a maple as we can plant, except that in the autumn, its leaves assume a yellow color, instead of the various colors of the rock-maple.

The canoe-birch of Maine is a far more beautiful tree in every respect than the gray birch of Massachusetts. All the birches are beautiful trees. You can have a forest of them in your own life-time which will be of immense value as timber, for they are rapid growers.

It has been stated that deciduous trees will grow better if planted with pines, and that is true. I attempted to grow deciduous trees on a side-hill, exposed to the wind, and lost them, because I did not protect them with pines and other evergreens. The moment I planted pines with them, they protected them from the northern blasts, and they grew with the utmost rapidity. I planted my trees seventeen years ago. It was a very windy place. My children suffered with croup, and other diseases of the throat. My house was on high ground, and I never supposed for a moment that the location had anything to do with the prevalence of this disease; but it was very much exposed; there was not a tree near enough to keep the wind away from it. Now it is perfectly protected by trees, and I have not had a case of croup since I secured that protection, though there are still young children in the house. This is an illustration of the influence of trees upon the atmosphere and upon health, by the protection which they afford against winds.

As regards the drying up of streams, I had a most interesting illustration of that when I was travelling in Spain, many years ago. I was riding on horseback through Andalusia, with a very intelligent peasant, who had been Washington Irving's guide, when he was writing his books, "The Alhambra," and the "Conquest of Grenada." He was an old man, and as we were riding along the bed of a brook, which was perfectly dry, I said, "Does water ever flow here, Manuel?" "No," he said, "except in winter, and then it is a torrent. It used to be a river in old times, as long ago as when the Romans were here." "How do you know that?" Said he,

"I will show you." In a few minutes we came to a precipitous rock, where there was a large bronze hook or bolt in the rock. Said he, "There is where the Romans made fast their galleys in the old times." That is an illustration of the effect upon rivers of cutting down the forests, as they have been in Spain, where the hills have been denuded of them.

Mr. EMERSON. I confirm entirely everything the gentleman has said. I see the earnestness with which he speaks, and I see, at the same time, that such a speech does not need confirmation. It is a delight to me to pass over the hill to which he has referred, and ride among his trees, as I do two or three times a week all summer long, on my way to visit my daughters and grand-children. Every word he says is true, and he might say a great many things of the same kind.

Mr. MANNING, of Reading. I have many facts to confirm what has been said by preceding speakers in regard to growing and transplanting our native trees.

The seeds can be sown, and if the surroundings are favorable, the result will be quite generally a success. Our native trees perfect their seeds at quite different seasons, and they drop at perfection; and, with comparatively few exceptions, our native forests have continued to grow with but little help from man. We can take our tree seeds, and by proper surroundings, can perpetuate them and control them to some extent. Such surroundings are only learned by close observation and long experience.

The seeds of the larch, for instance, which have dropped along the sidewalks in our grounds, are growing in the gutters, of two years' growth, ready for transplanting. Nature produced seed enough from the parent tree to have grown, with reasonable human aid, and produced many thousands of its kind.

We have sown the seeds of evergreens of various kinds in open ground; but such treatment is often a failure, in consequence of a lack of shelter for the young trees. Under a hot sun, they are too often killed just as they appear above the surface of the soil.

I learned something of the management of seedling evergreens and other forest trees by a visit to Robert Douglas, of Illinois, who grows untold millions of evergreen trees, and

scatters them all over the West. He sowed the seeds in beds, about four feet wide, raised slightly, with a foot-path between them. These seeds are not buried deeply. Most seeds require only a slight covering; the most important conditions are shelter from extreme dryness and the direct rays of the sun.

Strips of board, six to eight inches wide and four feet long, are placed the length of a lath four feet apart. Laths are nailed on, the width of a lath, one and a half inches apart. These screens are multiplied to cover acres of those seed-beds, and they assist in protecting the tender seedling. The screens are kept on for a year, or longer. Some seeds are more successful with a more continuous shelter. He used various devices. Thin white cotton-cloth was suspended about a foot from the ground, open at the sides. Then posts, seven to eight feet high, with rails across the tops, and over all a thick covering of oak branches, cut while in full leaf, and so securely confined on that a man could walk on them. This was continued over acres of prairie-ground. He uses these shelters till the trees become well established. Dry summer heat and a lack of rain, is often very destructive the first summer, and sometimes the second, and make shelter necessary for the preservation of the uncounted thousands of seedling trees.

All the maples, elms and birches grow freely from seed, and can be transplanted successfully. Oaks can be transplanted from forests, if taken when small, the tops to be cut back severely nearly to the ground, about the time of the swelling of the buds; shelter the first season with boughs.

In planting the acorns as they ripen in autumn, in a moist, porous soil, with a covering of hard-wood leaves, they push out the radicle root before winter. The following spring and summer a growth of four to twelve inches may be looked for. The second spring, take up and cut back the tap-root six inches below the point where the seedling came out of the ground, and plant two inches deeper than the tree grew. The lateral roots then start readily, and we find success quite sure, if the seedlings have been well protected between the time of digging and transplanting. If, without this root-pruning while young, you undertake to transplant the oak,

hickory, or chestnut at three to five years' growth, with the tops all on, the loss will be large.

I have a shellbark hickory, raised by the late Francis Dana, of Roxbury. He selected the largest nuts he could from bushels, and planted them in Dorchester. He dug with a trowel under them in July, when they were six to eight inches high, and cut the tap-root six inches below the surface. At two or three years of age they were transplanted and grew up five to eight feet, when various parties bought them. They are bearing fruit now. Their age is about fifteen years. One of mine is eight inches in diameter and twenty feet high. It bore half a bushel of nuts the past season, and has fruited for five years past.

Dr. Geo. B. Emerson. What is the character of the nut?

Mr. Manning. It is a shellbark nut, very thin-shelled. I think Mr. Dana root-pruned or transplanted the tree more than once. They were transplanted from his ground very successfully, for I have seen them growing in several places.

If I could remove the whole class of nut-bearing trees, also the soft-rooted trees, such as the magnolia, tulip, butternut, black walnut, virgilia lutea, etc., my choice would be to do it rather late in the season, say about the middle of May in this latitude, or just as the buds are swelling, and reduce the tops at the time of planting. Those are all hardy trees when once established.

There is something peculiar about the evergreens. If I were to name a particular month for transplanting them, it would be May. The general opinion is that June is the month to plant all evergreens; but June is too late to begin. It is better to be done planting all evergreens by June 1. It often depends much upon who does the work. Along our boundary lines, by several house lots, some six hundred feet in length was planted with arbor-vitæ trees, six to ten feet high. They were planted, as time favored, from June 4 to June 25. Some were watered, and some were not, as the soil and water varied. Sometimes the weather was very warm. We were personally at the work. The tops and many of the side branches were cut back severely to the height of five or six feet. The result is, not one dead tree in the six hundred feet of hedge, or nearly four hundred trees. It is all now visible

to any who may examine it. The season was quite favorable after June 7.

We kept on with the transplanting of evergreens,—Norway spruce, white and blue spruce, hemlock, etc., until into July. Most of these were taken from beds two to four years transplanted; many thousands were moved. A close examination will show scarcely any dead ones.

As a rule, it would have been preferable to have done this planting in May, but a favorable state of the soil and frequent rains made it much more successful than it would have been in the rather dry time we had in May. Quite a percentage of trees set in that dry season were less successful. A soaking rain directly after transplanting any trees insures success, even if a long dry term follows, if the trees were in good condition at planting.

Most of the European trees that I know of have a denser foliage than the American, and it holds on later in autumn. I have found a difficulty in regard to the permanence of the English oak. Perhaps they do not succeed so well in my soil as in heavier, stronger soil. Not one in fifty will make a good stem with regular top. The American red oak will grow with the utmost facility. The Norway maple is a hardy tree, and makes a very symmetrical, round head, but people are disposed to choose the rock-maple more than all other shade-trees combined, which almost invariably grows handsome, and can be transplanted with safety, and grows more conical than the Norway maple. The tops, or branches, of most of these shade-trees can be trimmed to any extent. I can show you a specimen of the canoe-birch, closely pruned, that is only a few feet high. That tree will bear trimming just as well as a buckthorn. For an evergreen, there is nothing more beautiful than the hemlock. It will bear pruning closely, and may be formed to any shape, and it is really one of the most beautiful trees we have. The only trouble is, it is too common to be appreciated. They will bear pruning so close, that you can make them appear like a mass of leaves, with not a single branch to be seen. You can trim the spruces, also, very close. Speaking of the beauty of American evergreens, it is curious what a variety of colors they assume, of the same species. You will find some of the white spruce

with a greenish color, but they generally assume a silvery look; then another specimen close by will have a bluish hue, so much so that I denominate them blue spruce. I saw last summer in Maine and in Canada, also along the St. John's River in New Brunswick, some of the finest spruces I ever saw, with limbs close down to the ground. I never saw a Norway spruce so symmetrical and perfect as were those white and blue spruces. I think they belong to one class, but they assume that different-colored foliage. A week ago last Saturday I set out twelve hundred white spruces that came from Prince Edward Island. November 20, they had been six weeks in a box. We will know of success next July.

The covering of our hills and waste lands with native forest trees is not a difficult thing at all. Mr. John A. Hall, of Raynham, Mass., more than thirty years ago, set out a great many acres of white pines, and they are growing now large enough for board logs. I had a conversation with him in regard to the matter, and he said he could plant them out for ten dollars an acre, setting them ten feet each way.

The CHAIRMAN. I suppose we are suffering to-day from the loss of our forests. When I left home on Monday, the weather was moderate, but I saw by the papers that there was a cold wave coming from the mountains, and I began to shiver. I knew that it would reach us before long, and in twenty-four hours we were in the midst of a Russian winter here. Why was this? I do not believe the climate has changed; but the difficulty is, that instead of there being forests to intercept and absorb the cold wave, or a portion of it, it all pours right over upon us. If the old forests had not been cut down, we should not have had that cold wave until this time, and it would have been so modified that we should not have felt it. But now, in the absence of those forests, it comes pouring down upon us, and never says, "By your leave." Now, if we will attend to what we have heard to-day, in twenty-five years we shall not have these cold waves coming over us.

The Board then took up the next subject upon the programme, Cattle Husbandry, and Dr. LORING was called upon to open the discussion.

CATTLE HUSBANDRY.

Dr. Loring. On the subject of cattle husbandry I suppose there is now but little difference of opinion. But if you desire me to open the debate, I am happy to do so.

I am glad to say, Mr. President and gentlemen, that there is one branch of agricultural industry remaining in this country which has not been affected, so far as I know, by the cutting of the forests; the cattle still flourish "on a thousand hills," and your call upon me to present this matter of discussion, before the meeting, deprives me of the opportunity which I desired, when the former debate was going on, of saying that I was hardly ready to accept, to its fullest extent, the declaration that the forests controlled our climate. You will pardon me one moment while I dwell upon this matter, because it is one of such serious moment to man and beast, that I have no courage to deal with the animal kingdom, until I have given you and them the assurance that we can stand it a little longer without covering our land with an unbroken forest.

I accept, generally, the statements made by a gentleman more profound and older than I, in regard to this matter, and I do it because there is no sight more delightful to my eyes than that of a man passing down the declining years of life, with the old enthusiasm for nature burning in his veins still; and I assure you, one and all, farmers and scholars alike, that while everything else passes away, you will find, that whatever natural object you have cherished in your youth, be it a tree or an animal, that will remain by you in your declining days; and after your eyes have become so dim that your books have no further charm for you, and your ears so deaf that music has no joy for your soul, your cattle and your hills and your trees, which you have cherished all your life, will remain a source of happiness still.

I like this enthusiasm for the forest and trees, and those who cherish it I know will pardon me if I differ from them. Mr. Emerson accepted, in a kindly and courteous way, differences of opinion that were advanced by one gentleman here much younger than himself, and I know that he will be patient

if I do not agree with him, and that he will be perfectly willing to accept the theory of an inexperienced young agricultural orator, unused to expressing his opinion, and perhaps unused to properly forming one.

I think, sir, that the winters were just as cold, the streams just as dry, and the changes of temperature just as great, when the Pilgrims landed on these shores, as they are to-day. I have not the slightest doubt of it. I know that there are periods of years in which the rainfall is so great as to actually impede the progress of agricultural labor. That has occurred in my day. From 1856 to 1864 we were absolutely drowned out here in Massachusetts. There were not, in Essex County, twenty-five thousand tons of well-cured hay made annually during all these years. The rainfall was so great that it was impossible for the farmers to secure their crops, and it did seem as if the day had come when the windows of heaven were open and the floods were again upon us. Since that time, we have suffered in another direction; we have not had half rain enough. The changes of heat and cold moreover were as great, in the olden time as they are now. Think of that cold, hard, intense winter of 1816,—where were your forests then? The driving, piercing cold of 1620,—where were your forests then? Why, we are told that—

> "The rocking pines of the forest waved:
> This was their welcome home."

The land was one great forest. What is this story of drought in the olden times, when the corn-crops were all cut off? What is that record of the Pilgrim History of Plymouth, when their crops failed them, because "no water fell from heaven"?

Is it entirely true that we depend upon the continuance of our forests for our rainfall? Do you really believe,—let me ask you, Mr. Chairman, in all sincerity,—do you really believe that it would have been one degree warmer, day before yesterday, or yesterday, if there had been one interminable forest from Minnesota to Haverhill?

Dr. Wakefield. I do, most assuredly.

Dr. Loring. Well, sir, I do not. I do not believe it could have affected the temperature here even half a degree.

If it were so, why in the world did our ancestors find themselves compelled to record so many cold winters? The climate was as variable, and the cold as great then as it is now.

Now, one word with regard to the drying up of the streams in these modern days. The Connecticut is as large a river to-day as when the country was discovered. The Merrimack is as large a river now as it was then. I think the Mississippi is as great a river as it was in olden times. There is no doubt about it. More than all that,—for these dire forebodings of cold and drought are terrible, and I wish to encourage the gentlemen a little who are sitting around here pallid with fear at the thought that they are to be frozen to death or dried up,—more than all that, I say, there are more forests to-day in Massachusetts than there were twenty years ago. There is more woodland in Massachusetts to-day than there was twenty years ago; and (I am sorry on account of the cattle to say it) there is not half as much pasture left. That is a fact. The trees are increasing everywhere. They are increasing, as a matter of taste, everywhere. They are being planted by everybody. The gentlemen who have preceded me have all told us what an increasing taste there is for planting trees here, so that the day has come when every farmer is ornamenting his estate. I am sorry to say, however, that the time seems to have gone by when there was an ambition to plant that one solitary monumental tree, the old American elm, standing now beside the decaying homes of our ancestors;—that tree which, when those homes have passed away, will be looked upon by the investigator of after generations, as the monument of men unequalled for their sturdy independence and their strong arms and determined zeal in defending their rights and their opinions,—that American elm, unequalled in its magnificence, and unequalled in all its historic associations!

The planting of trees has become a national duty here, a national business, and a taste among the people. There is no necessity, therefore, for encouraging that, for it is everywhere; and when we have discovered the law by which trees can be planted, and planted well and profitably, we shall then have learned another branch of agriculture, as well as culti-

vate a new branch of taste. As to the profit of cultivating trees, let me mention a single instance, before I close this accidental portion of my remarks. There is a piece of land in Lancaster, in this State, which was purchased in the early part of this century, and was suffered to stand until the purchaser died, a period of about half a century. It was a piece of "sprout land." The pines had been cut off. The tall masts of many a stately ship had stood there, I doubt not. The trees were cut down, and the land was bought for perhaps a dollar an acre, which was about the price in those days. This land remained undisturbed for half a century or more, and when the owner died, and his sons settled his estate, they found that that land had increased in value in larger ratio than land on State Street during the same time.

So much for the profit of tree-growing. That forests can be cut down judiciously, and raised judiciously, there is no manner of doubt; but let me suggest to you that there is no more propriety in insisting upon it that an old forest shall be allowed to stand, in spite of its falling branches and its decaying heads, than there is in insisting that a farmer shall not touch an old decayed orchard that his great-grandfather planted before the battle of Bunker Hill—not the slightest. The time always comes when an old forest should be cut down, just exactly as you would remove any other old obstacle in the way of progress. Remove it, and give nature another chance. Do not insist upon it, that because a forest is old, it must not be touched. Cut it down, if the proper time has come, and wait for nature to take the next step in that branch of business. Then plant your trees, or devote your land to the growing of trees, just exactly as you plant corn and potatoes, or sow barley and wheat, or turn to the raising of grass. It is just as much a branch of business as either of these, if you propose to pursue it profitably and well.

In regard to the planting of trees, let me say one word. I have planted a great many trees, and have lost a great many, as everybody has. You cannot plant a Norway spruce successfully upon an elevation exposed to the violent north-west or north-east winds. It will not stand it. I have tried it over and over again. If you want the handsomest tree that grows, put the white pine there. If you want the next hand-

somest, put the Scotch pine there, and the harder the winds blow, and the more the sea-fogs drive in, the faster it will grow. If you want the next best tree, get the Austrian pine,—one of the sturdiest, one of the most splendid and reliable of all European trees. If you wish to transplant evergreens, whether white pines, Norway pines, Austrian pines, or Scotch pines, transplant early in August. That is my experience. I can make more white pine trees grow if transplanted the first week in August than at any other time, simply because the wood is formed, and they will go to work and take root for the next season. I cannot transplant white pines in May or June or July; I cannot transplant them in autumn; but I can in August, and have them live; and so of all the trees of that character that I have ever undertaken to set out.

So much for trees; now for the cattle—the cattle that live under the trees. That reminds me of another point that was made. You see how much I have to do, if I clean up as I go along. Mr. Emerson, who knows about trees and loves trees, says, if you want your cattle to enjoy themselves, and to thrive, let your trees stand in the pastures, so that they can find shelter from the hot noon-tide sun. Now, the experiment on this point has been carefully tried. Half a dozen oxen were put in a pasture where there was an abundance of shade, and it was found that they passed their time under the trees, when they ought to have been feeding, and their thrift was small; but when their pasture was changed, and they were put where they had no opportunity to seek this shade, they throve much better. I have never seen the slightest benefit from trees in a pasture.

Now, I come to the subject before us—Cattle Husbandry. The first question is to find out exactly what kind of cattle your farm is suited to. We have at various times introduced Shorthorn cattle into Essex County, and they have not succeeded well. Essex County has not in it to-day a single Shorthorn farm. And when I talk about a Shorthorn farm, I mean a farm that is so luxuriant in its pastures, so abundant in its hay-crop, that Shorthorns can do as well here as in Ohio, Illinois and Kentucky, and in some parts of the Connecticut Valley. Here and there in New England there is a Shorthorn farm,—a farm adapted to the growth of large beef-

producing animals. There is one in Connecticut, owned by Mr. Benj. Sumner, which is really a farm of that description. There is one in Vermont, owned by Mr. Winslow, of Putney, which is another of that description. Up and down the Connecticut Valley there are a few more; but as a general thing, the large, heavy-growing cattle, known as Shorthorns, are not adapted to our farms here, either for the dairy or for beef. In the State of Maine, in some fortunate localities, as in the valleys of the Sandy and Kennebec rivers, heavy cattle thrive and do well. We must look upon those farmers there as fortunate exceptions. With our shorter pastures, we must, as a rule, devote ourselves to the productions of the dairy, rather than to the productions of the stall; and so I would recommend to the farmers here in Essex County, and throughout New England generally, that they should select cattle of such moderate proportions that the short pastures here will feed them well, and of such large capacity for giving milk that they will find ample remuneration in the great milk markets that are continually growing up here on every hand. That, it seems to me, is the first law of cattle husbandry. And so, when you are selecting animals for the dairy as a business, do not select those which gratify your eye on account of their large proportions, but select those which, by their size, and their general anatomical structure, and the physiological law that lies within them, can produce the largest amount of milk on the smallest amount of food.

Now, I am laying down this law for the best of reasons. Have you not been asked, over and over again, "How much does your milk cost a quart?" How can you tell? One cow will make fifteen quarts of milk a day upon the same amount of hay and meal and shorts that another cow will consume in making four quarts. How are you going to tell what your milk costs? One cow is producing her milk at a cost of perhaps ten cents a quart, and another is producing her milk at a cost of perhaps two cents a quart. How are you going to tell how much your milk costs? You cannot tell. It is one of those questions that no man can definitely answer. You can tell how much you have spent in raising the milk your herd of cows has produced, taking into account the amount of hay consumed and the amount of grain you have bought.

But when you are asked, how much your milk costs in the general run, you cannot select cow after cow and estimate properly. The only law you can possibly adopt is the one I have laid down here: Select that animal which, on the smallest amount of food, will produce the largest amount of milk. That is the law which lies at the basis of cattle husbandry.

Now, in order to attend to this properly, we must learn our lesson from those people who have accomplished the object. I am perfectly free to confess to you here, gentlemen, that I have adopted, bred, fed and used what are usually called Ayrshire cows for nearly twenty years. I began early to import them and encourage their importation into this country, into this State, especially; and I have often found that whenever I have discovered in a herd of coarse, heavy cattle, a cow that was particularly profitable, I have been told "she resembles an Ayrshire." I wish that Mr. Holland, of Barre, were here, that I might call him up to testify to the vast service that he performed to his own herd by the introduction of an Ayrshire bull twelve years ago, to reduce the size and consolidate the forms of his cattle; and I would say to him, that the half-dozen grade calves, Ayrshire and Durham, that had been bred in that way, which I purchased of him in 1869, were half a dozen of the best cows I ever had in my dairy herd. They had the loose texture of the old-fashioned Durham, and they had the compact form, the level hip, the fine shoulder, the flat rib, the admirable strong head, the wide mouth, capable of taking in food with great rapidity, the compact stomach, the great milk-veins, and all the characteristics which go to make up a first-class dairy cow. Every one of them had these indications of a good milking animal, and they have gone on from that time to this, doing their duty in my herd faithfully and profitably. I say, therefore, I am not an advocate of this class of animals because they are Ayrshires, or because they grow in Scotland, or because they are on my own farm, but because they answer the great rule which I have laid down for the best dairy cow. These calves that I purchased were grades, created by an Ayrshire bull upon a broad, coarse-hipped Durham cow. I call it the Durham cow of Barre, because the dairy cows of Worcester County are not the modern improved Shorthorns; they are the old-fashioned

Durham which was in vogue in the days of Governor Lincoln, and were bred from the large dairy cow, imported by him into that section of the State; the same cow that Mr. Derby imported here in 1801, and which broke down here; the same cow that was taken into the Connecticut River valley by Mr. Williams, and which laid the foundation for the great dairy herds in the rich pastures of that valley,—a coarse, rough-hipped cow, but an admirable one, and a great feeder.

Mr. Wetherell. Were they thoroughbreds?

Dr. Loring. There is no such thing as a thoroughbred, I am happy to say, in any animal, except a horse, unless it is that the Shorthorn breeders, having kept their herdbook perfect for so many years, will insist upon calling their animals thoroughbred Shorthorns. I am willing that they should have that privilege. We call our Ayrshires pure-bred Ayrshires; and that is a good name enough. They are animals that have bred a great many years in the same family and have fixed their type. I am happy to say that pure-bred Ayrshires are as good as grades. Grades are cheaper and easier to get, but you can find just as good pure-bred Ayrshires as grade Ayrshires. There is no doubt about it. The capacity for milk is preserved in the family. If you have a herd of grade cows, the advantage you have is, that you can use an Ayrshire bull in such a way that the investment is a small one, and you can raise grades by a smaller investment than you can raise pure-bred animals.

If you ask me, "What is this animal called an Ayrshire?" I say, it is a good cow; but the law will apply to any other class of cows as it will to Ayrshire cows. I mean a cow of such moderate size that she will not interfere with anybody, to begin with; a cow that manages herself handily, easily; a cow that possesses that vigorous, elastic, powerful constitution which never belongs to a coarse-boned, overgrown frame.

An Ayrshire cow, then, is a cow made up, anatomically, physiologically upon the best model for a cow; that is, a good cow, generally. She has that structure of the head which indicates a contented, placid disposition and a powerful constitution; a calm and steady eye; a face that is as expressive as a cow's face can be; as much of an intelligent look as an animal of that description can have. A horn not too large at

the base, but large enough to indicate that there is a strong constitution there; a head wide between the eyes, and pretty high above the eyes to the root of the horns. I think a cow that has a broad base to her head is the best. And if she has a large, luxurious mouth, that looks as if she was made for business, and can fill her stomach rapidly, so that she can lie down and digest and repose, she will be all the better fitted for the business of the dairy. I would have a cow's neck small enough to be graceful, but not too small; not an ewe neck,—that is not necessary,—but gracefully, delicately and elegantly set on, without a waste muscle in it, but with muscle enough to make it a strong, vigorous and powerful part of the animal's body. The shoulder of an animal of this description should be as near like the shoulder of a good trotting-horse as it can be; not straight up and down like a thoroughbred's. The shoulder of a good dairy cow should be a little loose, with the blades not rising above the backbone, with strong, powerful muscles, and a good substantial base, with a fore-quarter under it as straight as a plumb-line. Crooked-legged, knock-kneed cattle are never graceful, and seldom profitable. The legs should be strong and well defined, and the cords and muscles should stand out clean and prominent. The milk-vein should indicate a good superficial vascular system, which means simply this: it is an organization in which the superficial circulation of the blood indicates that what are called the secretory organs are active in the interior. The next sign of a good cow is an open, bony structure; not a coarse or loose-fibred, bony structure, but a bony structure that is so articulated or hung together that there is elasticity and ease of motion about it. Now, where are you going to find the indicative point that will tell this story? Put your finger into the point of the shoulder, and see if the cow has a cup-like cavity there. If she has, ten chances to one she will be a good milker; but if not,—if her shoulder is hard and compact, even if she is milking well to-day she will be likely to fail to-morrow.

Now, when you get past the shoulders, what do you come to next? You come to the ribs. Upon a good chest development depends almost everything else in a dairy cow. She must have a finely-shaped chine, and the spring of her ribs,

from the spine down through her heart, must indicate that she has a strong circulation; but you do not want her brisket as deep as a steer's, or like a Shorthorn bullock; you want the shape I speak of, and you want with it a certain delicacy of organization which indicates that the circulatory system is a strong one, and that neither the heart nor the lungs are impaired. But to go back to the ribs. You want a rib, not round, like your finger, but flat and wide. When you put your hand on it, it should feel as flat as a lath; and if you can get at the edge, you should find the edge sharp, and not a round bone, like the rib of swine. A round rib will answer for a beef animal, but not for a good dairy cow. Her backbone, moreover, should be open and loose, so that if you run your hand along it, you will feel those little cup-like cavities. Let her hips be strong, not too wide, and her hind-quarters upright, substantial, vigorous. Let her have a long hind-foot. I never saw a short-toed cow in my life that would perform the work of the dairy well. A long hind-foot, and a good, broad, ample fore-foot. Then if, in addition to all this, you can get a hide that is elastic and soft, covered with a warm, substantial coat of hair, with a good milk-vein and an udder which is packed up well between the thighs, and so organized that there is no danger of inflammation, there you have got a cow that will produce all the milk you ought reasonably to ask, and which, when she has completed her dairy-work, can be so fattened as to produce in an economical way your five hundred and fifty pounds of as good beef as can be fed on a mountain pasture or in stall.

That is all I know about cows. There is a great deal more to be said about feeding them, and taking care of them; but all that I refer to the meeting.

J. D. W. French, of North Andover. Dr. Loring, in the remarks which he made here yesterday, referred to the Oakes cow. Ever since I began to breed cattle, the Oakes cow has been thrown in my face. Only two or three years ago, in my own town, a man stood up and read an essay before our county society, in which he proved, to his own satisfaction, that for twenty years, in Essex County, and in our town, there had been no improvement in milch cattle. I said to myself, "Can this be true, that in Essex County, and in our

town, there has been no improvement in milch cattle?" Well, sir, at the end of his essay, to clinch the argument, he brought up the Oakes cow. I find that is generally the way with gentlemen. After having exhausted the subject, as they think, they bring in the Oakes cow to clinch the argument. That Oakes cow has been to me, I may say, a bugbear. I have suffered from that cow. I have had what you might call "the night cow," which is a species of nightmare, and after reading the report of Dr. Loring's remarks, I said to myself, "I will look into this matter and see what the Oakes cow has done, and the next man who says anything to me about that cow, I will ask him, 'Have you ever heard what the Oakes cow did?'" I looked the matter up, and wrote an essay in which, I think, I proved that there were cows in this county as good, if not better, than the Oakes cow.

Now, I want to read just what the Oakes cow did, because it is not always stated. Men will say, "There are no cows at the present day equal to the Oakes cow," but they do not state what she did, nor do they state how she was fed. The greatest amount of butter the Oakes cow ever produced in one year was 484¼ pounds, in 1816. That has been held up as a great yield. She produced 19¼ pounds in one week, and an average of more than 16 pounds a week for three months in succession. The largest amount of milk given in any one day was 44½ pounds. Now as to her feed. She was allowed from thirty to thirty-five bushels of Indian meal per year, all her skim-milk, and most of her buttermilk. At one time her owner gave her potatoes, and in the autumn he gave her about six bushels of carrots. I compared this with the yield of "Sibyl," an Ayrshire cow. She gave in one year 1,365 pounds of milk, or about 6,000 quarts, on poor feed, too. The value of the milk of "Sibyl," at five cents a quart, would be $300. The butter of the Oakes cow, at fifty cents a pound (which would be a high price), would be only $242 and some cents. This would not make the Oakes cow as profitable a cow as "Sibyl," because "Sibyl" was kept at less expense, and her yield in dollars was greater.

Adjourned to two o'clock.

Afternoon Session.

The Board reassembled at two o'clock, and took up the last subject upon the programme.

THE CULTIVATION OF FRUITS.

The discussion was opened by Mr. A. P. Slade, of Somerset, who spoke as follows:—

The subject of conversation this afternoon is Fruit-Culture, and the task of opening the discussion has very unexpectedly been assigned to me.

When I see gentlemen present who have made this subject a life-study, the light of whose experience has ever been our guide, I am really at a loss to determine the reason why one was not selected from their number to advise and instruct you on this occasion. I have heard of an old gentleman, living in the town of Barrington, R. I., the father of a large family, who was renowned for the sumptuousness of his Thanksgiving dinners. But he required each of his guests to eat a green quince for the first course, in order, as he alleged, that they might the better appreciate the rich repast which was to follow. The committee who arranged the bill of fare for this meeting, and appointed me to open the discussion, were, undoubtedly, governed by a policy involving the same principle.

However, as opening a discussion is somewhat vague in its meaning, I shall take the liberty to put my own construction upon it, and endeavor to provoke discussion on this interesting and important subject. And if I am fortunate enough to succeed, I shall flatter myself that I have accomplished the end and aim of my appointment.

I do not propose to select any particular kind of fruit, and follow out in detail its culture from the simple seed to its luscious maturity, but, on the contrary, I propose to consider very briefly, the possibilities of fruit-culture in Massachusetts.

I think I am safe in assuming that there is no State in the Union which, in proportion to her population, spends so much money for fruit, or that consumes so great a quantity as the old Bay State. If the fruits which we consume are adapted to our soil and climate, and can be profitably cultivated by our farmers and gardeners, it would seem that no ordinary obstacles should prevent their cultivation. Our cities and large towns are unsurpassed as fruit markets, the demand being generally brisk and the prices remunerative. The Western fruit-grower being aware of this fact, sends his apples to the Eastern market, and you will scarcely find a grocery-store in the State, at the present time, that has not on hand a few barrels of Western apples. They are large, fair, and handsome, I admit, but the question is, Ought we to depend on other States for them, or should we produce them ourselves? I shall be told, I am aware, that we cannot compete with the West in raising apples, and it is useless to make the attempt. This matter can be best determined by a fair trial,—an experiment, I apprehend, that has not been frequently made of late years.

Formerly an orchard was considered a good investment; trees were freely set, and the fruit was fair and abundant. But this old-fashioned practice, I regret to say, has been brought into disrepute, and in travelling through the State, we rarely meet with a newly-set orchard. Now, I pretend to say that we can raise apples of superior flavor, and as large and handsome as they can in New York or Michigan, and there is no good and sufficient reason why it should not be done. It is done, to some extent, in Bristol, Middlesex, and Hampden counties, and, for aught I know, in other parts of the State.

True, we have obstacles to overcome and enemies to subdue, with which the Western fruit-grower is just beginning to be made acquainted. The borer, curculio and canker-worm are indeed formidable enemies; but are we to quietly submit to their ravages and acknowledge their supremacy? No man who cultivates the soil of Massachusetts, I care not what may be his crop, unless it be a crop of weeds, must expect to succeed, without waging an unceasing war against the hosts of insects injurious to vegetation. All the small

fruits and cereals, and every vegetable in the kingdom, has, and always had, its own peculiar insect enemy, whose depredations commence with its existence, and if suffered to go on, end only with the complete destruction of the crop. And the erroneous notion is entertained by some people, that this is something new, or of quite recent origin, and confined to particular localities. The canker-worm and caterpillar have a historical notoriety; and more than thirty-five hundred years ago the people of Palestine were annoyed by these pests, as one of the curses of disobedience. The historian says: "Thou shalt carry much seed into the field and shalt gather but little in, for the locust shall consume it; thou shalt plant vineyards, but shalt neither drink of the wine, nor gather the grapes, for the worms shall eat them; thou shalt have olive-trees throughout thy coasts, but thou shalt not anoint thyself with the oil, for the olive shall cast his fruit." The onion-maggot was undoubtedly a pest to the ancient Egyptians, and the rosebug annoyed him who planted the first vineyard.

Now, I am going to recommend the setting of apple-trees,—restoring the orchards. I am aware that this advice savors of heresy, but nevertheless I shall urge it; but I do it on one condition only, and that is, that it be well cared for. A man would not think of setting a vineyard and expect to raise a profitable crop of grapes without bestowing upon it all the attention that it required. Those of you, gentlemen, who listened to Dr. Fisher's admirable lecture, at Fitchburg, two years ago, must have discovered that his success depended wholly on his knowledge of the wants of the vine, and the promptness with which he supplied those wants. A neglected orchard is one of the most melancholy sights on the farm. It is suggestive of poverty, laziness and bad husbandry; and it is safe to judge of the character of its owner by the condition in which you find his orchard.

Having decided, then, to do the work thoroughly and faithfully, select a suitable lot, on the highway if possible,—it need not be the best on the farm, or very near the house, nor entirely free from rocks and stones; but it should be one that is neither wet nor dry, and that has not been exhausted by continual cropping. New land that has been recently cleared

of bushes or wood, or a swale that has been thoroughly underdrained, is, perhaps, preferable.

Plough it deep, and manure it well. Go to a reliable nursery-man and select not more than five or six of the most popular varieties,—embracing summer, fall and winter apples. The proportion of each may be a matter of taste, or may depend on the market they are intended for. The cube of some one of the nine digits makes a very good proportion. And in setting an orchard of eighty trees, for instance, I would set four of the summer, sixteen of the fall, and sixty-four of the winter varieties. Whatever may be the proportion, be sure to get the very best stock that the market affords. Never set an inferior tree, shrub, plant, or vine, because it is cheap; it will be dear in the end. Set the trees thirty-five feet apart, and, following the advice of my friend Moore, you will set them in straight rows. Grow a crop of strawberries, or a big crop of vegetables every year among them until the trees shade two-thirds of the ground. Prune them at no particular time, but just as often as you see that they need it. Examine the butts with a sharp or pointed knife just below the surface, twice a year, about the first of June and the first of August, and take out the borers; at these times they are young, and will be readily found just beneath the outer bark. Dissolve some potash, at the rate of one pound to a gallon of water, and wash the trunk and limbs, up as high as the leaves, once a year. This will destroy the lice and eggs of insects, and will give a shiny appearance to the bark, which will attract the attention of your neighbors; and if you keep the ox-cart and pigpen out of your front yard, people, as they pass your premises, will admire your trees, and call you a neat farmer; you will soon begin to relish the compliment, and feel proud of them. And where a man has an orchard, or anything else of which he is proud, he will take care of it, and proper care and treatment will insure success. Keep off the caterpillars, not only from your apple-trees, but from your wild cherry-trees, and from all other trees on the farm and by the roadside. If you anticipate trouble from canker-worms, encircle the trunks of your trees with a trough, filled with kerosene oil; it will form an impassable barrier, and keep them at bay.

For the first twelve or fifteen years they will require no other cultivation than what they will get in common with the crop that is grown among them. About this time they will begin to bear, and the crop will annually increase with their growth until they come to maturity, which they do when from thirty-five to forty years of age.

After you cease ploughing and planting your orchard, it should be manured once in three years, at the rate of thirty horse-loads of manure to the acre, spread broadcast, but not very near to the trunks of the trees; and once in three years two bushels of ashes to the tree should be applied in the same way; and once in three years substitute twenty pounds of crushed bone to the tree, and if you find it convenient to mulch them in the fall, all the better. Turn in your breeding sows about the first of May, and keep them in till the first of September; and if they do not keep the ground thoroughly pulverized, you may conclude that you have not the right breed.

The above details, briefly given, constitute the *modus operandi* by which handsome and salable apples can be raised in Massachusetts, and as profitably raised as almost any other crop.

I am fully convinced that the prevailing prejudice existing against orchards has grown out of the gross negligence of those who have had them in charge. They have been treated as a wood lot, and regarded as something that could take care of itself, and was expected to yield a crop year after year as though the soil contained an inexhaustible amount of material of which fruit is made.

One grave charge frequently brought against apple-trees is, that they bear only every other year, and I once knew a man to cut down a thrifty orchard, not because it did not bear, but because it did not bear when fruit was very scarce.

In 1850, I set a small orchard. I bought my trees of an old gentleman who had kept a nursery for fifty years on land on which a part of the city of Fall River now stands. In selecting my Baldwins, he asked me if I would have such as would bear the odd years. Not exactly comprehending him, I told him that I would take such as would bear every year. He replied, that "if you take them from this row, they will bear

the odd years, but if you take them from that, they will bear the even years." If I remember rightly, my faith in his creed at that time was very weak, but I decided to take half from each row. The result, however, verified his assertion until last year, when every tree in the orchard seemed bent on doing its level best. Those whose fruit was due this year produced about one-half barrel each. I asked the old gentleman how so remarkable a phenomenon was produced. He replied, "If you want to make an apple-tree bear next year, you must pick the blossoms off this year, and in that way you can change the bearing year, and the scions of the tree will inherit the tendencies of the parent stock."

I had thought of examining this subject in the light of an investment, and comparing its net profits with that of other crops. But realizing that our time is precious this afternoon, and that there are many gentlemen present who are anxious to take up the matter of small-fruit culture, I will just say that I have a small vineyard which has never failed to ripen its fruit till this year. I raise a few currants and some strawberries, and I cut some asparagus. I manage these crops according to the best of my ability, and yet none of them return so great a net profit as the small orchard before alluded to.

The labor of setting an orchard and taking care of it for the first ten or fifteen years is light and trifling, compared with that bestowed on some of the small fruits. One hour spent daily for ten days in the year, will afford ample time for pruning, washing, looking after the borer, and removing the caterpillars in an orchard of fifty trees. This work is not laborious, and can be done by boys or old men.

The apple is one of the oldest and best of fruits. Its consumption is more universal than any other grown in this latitude; in fact, the man, woman or child who was not fond of apples, would be a curiosity well worthy the acquisition of the great showman. It can be kept a long time without losing its flavor, or material loss from decay, and it is really a matter of serious regret, that the current of popular prejudice in Massachusetts is setting so strong against its cultivation.

Let me say, then, to the young men who have decided to

make farming the business of life, and to those who have inherited the ancestral estate, as you reverence the old homestead, and as you value the reputation of Massachusetts husbandry, be not dissuaded from setting an orchard.

Mr. L. P. Warner, of Sunderland. I would like to know what varieties Mr. Slade would advise us to set. I have supposed that only a few varieties would grow to perfection on the Connecticut River. The Northern Spy I have never seen, the Snow Apple I have never seen well ripened, and I could mention several other well-known varieties which will grow in New York and other States, which I have never seen in our State. My idea is, that it is not necessary that we should grow all the varieties of apples that are called good in Massachusetts. Let us grow those that we can ripen to perfection. We have as good varieties of summer, fall and winter apples, that will ripen in Massachusetts, as they have in any other State in the Union. I know that the varieties differ somewhat in different localities; but in the latitude where I live, the Baldwin, Rhode Island Greening, Hubbardston, and what we call the August Sweeting, are apples that grow large, fair and handsome, and ripen in their season.

Question. Does the Russet grow well in your vicinity?

Mr. Warner. It does tolerably well. I think it does not grow so well with us as it does in Essex County. I may as well say here, that I am familiar with an orchard of forty trees, set out seventy years ago last spring, and it bore last year two hundred bushels of handsome apples, and this year, one hundred bushels. That is a fact which I think is somewhat remarkable. I will further state, that that orchard has been kept constantly under culture. That is, the ground has been stirred every year, and generally it has been planted to potatoes, but of course it did not produce much. It was planted more for the purpose of keeping the ground in good condition than it was for the crop. But I was surprised when I saw the fruit that came from it last year. There were two hundred bushels of very handsome Russets. I did not see them this year, but I was told that it bore one hundred bushels.

Question. Will not hogs injure the roots of the trees?

Mr. Slade. Not at all.

Mr. Cheever. Won't you describe the August Sweeting? Is there any other name for it?

Mr. Warner. I do not think there is any other name. At least, I have never found any other apple that answered that description. It is an apple that grows about as large as the Hubbardston. It is cream color on one side, with a pale red stripe up and down on the other. About half of it is colored. It is very juicy, and of excellent flavor. It is an apple that lasts about a month, and sells very readily for an eating apple.

Question. Superior to the Sweet Bough?

Mr. Warner. Yes, sir; I think so.

Question. Have you known anybody to change the bearing year by picking off the blossoms?

Mr. Slade. Not of my personal knowledge; but some years ago, a gentleman from Mansfield, who was visiting my place, wanted to know how it happened that my trees bore that year, and I simply told him, just as I have told you. "Well," said he, "I have tried it, and I have changed the bearing year by doing that." I saw him not more than three weeks ago, and he told me that he got more apples this year than all his neighbors put together, for his neighbors did not have any, and he had a fair crop.

Mr. Perry. There is one orchard in our neighborhood which bore this year bountifully; I do not know of another. There is one in the town of Sherborn, but that is the only other one I know within sixteen miles of us. I went to the orchard in our village to get some Porters, and, looking around, I saw that there were a good many Greenings and Baldwins in the orchard, and I asked the man how it happened that his trees bore the odd year. He said that he had brought it to that state by picking off the apples when they were young, and picking off the blossoms, and keeping the orchard under good cultivation all the time. He had in his orchard, which was not a large one, three hundred and fifty bushels of Porters, which he sold for two dollars a bushel as fast as he could pick them. I think he had as many Baldwins and Greenings, and all of them good; and hardly any worms, or anything of the kind. I thought then that it

ought to be known, if it was not, that picking off the blossoms and small apples would change the bearing year.

Mr. Wetherell. I will state a fact in connection with this subject. A farmer in Groton, when I was there a few weeks ago, riding with me by some orchards that were well loaded with apples, especially with Baldwins, said: "Those trees show the benefit of the canker-worm. Those trees used to bear upon the even years, but they have been defoliated by the canker-worm the bearing year, so that they just escaped being killed, and the next year, the odd year, they bore luxuriantly. So much we have to thank the canker-worm for." This shows that the change has been made without the labor of picking off the blossoms by hand.

Mr. Cotting, of Hudson. On our ancestral farm, some twenty-five years ago, we made a nursery, and from a Baldwin tree, planted before I can remember, I selected some scions, which I cut in February or the first of March, and put them in a cool place. The early part of the next April, I grafted with my own hands a row of trees in the nursery, and from the same bunch of scions I grafted two other rows, from the 20th to the 25th of June. When those trees grew to the proper size to be set out, they were taken up and put in the orchard, without any choice of trees, taking them indiscriminately from the two engraftments. We have trees that bear every other year. There are apples every year. Last year they were a drug. This year we had more Baldwin apples than perhaps the whole town of Berlin put together. The farm is in Berlin, Worcester County. The apples are exceedingly fine. And let me say here, that since I was a small boy, there has never been a canker-worm on the two thousand trees on that farm. We have never been troubled with the canker-worm, but have been troubled by caterpillars.

The Chairman. We have with us the Secretary of the Board of Agriculture of Connecticut. He is well posted on the subject of fruits. Will Mr. Gold come forward and give us some of his views?

T. S. Gold, of Connecticut. This is a subject in which I am too much interested, to allow this opportunity to pass without saying a few words in behalf of fruit-culture in New England.

I am one of those who have full faith in the importance of the culture of fruits as a branch of our husbandry, especially in this transition period through which our agriculture is now passing. Just as manufactures, here in New England, have passed, in good degree, through their transition period, until they have gained their high supremacy, during which they have been gathered from every little streamlet and every hamlet in New England into these great centres of manufacture, so agriculture is passing through a transition stage here, and we find ourselves obliged to relinquish to the great and fertile West many of the staple crops of the farm. We must, therefore, turn our attention to those crops which, from our location and proximity to market,—the nature of the crops themselves not allowing of distant transportation,—give us high vantage-ground, compared with our Western competitors. I claim that that is especially the case with the culture of fruits; not only of the small fruits, preëminently, but also of the larger fruits, the products of our orchards; and I say that we should look to them for one large source of relief in the present condition of New England agriculture.

It has so often been said that Jersey is the place to raise strawberries, and so on, that it has almost been admitted as a foregone conclusion that we in Connecticut, or you in Massachusetts, cannot compete with Jersey. But how is the fact? I visited the strawberry plantations in Connecticut again and again last summer, and my attention was called to the fact that the amount and quality of their products vastly surpassed any of the boasted fields of Jersey. I suppose the same thing is true of the strawberry plantations of Massachusetts. The thing has been done, is being done, every year, and can be done continually. There is no need of your paying out, here in Massachusetts, as you do, such enormous sums for the miserable products of the Jersey and other Southern gardens in the way of strawberries, just because they come a few days before your better Massachusetts product. So with regard to the whole line of small fruits. The raspberry can be cultivated most successfully here, and every farmer can have, for the supply of his table, and for market, a succession of this fruit that will last, in its three or four leading varieties, every day for a month. There is no difficulty about it. I have accom-

plished it myself, in my own garden. A little patch devoted to three or four kinds of raspberries has given us an abundant supply for a family of from a dozen to twenty for over a month,—taking the various kinds, the red, the black, and the yellow varieties.

Then there is the currant. Owing to the ravages of the currant-worm, many of the smaller cultivators have been deterred from its culture, so that it is now one of the most profitable fruits to be cultivated for market on the whole list. It cannot be grown anywhere with more success than upon the strong soils and in the clear cool air of our New England hills. I commend that fruit, and I think the most successful examples of its culture I have ever seen, I witnessed last season in some of our fields.

With regard to the grape, last season was somewhat too short. Very few vineyards, comparatively, succeeded in ripening their product; yet still, the results of the last few years have been very encouraging, and perfectly satisfactory to the cultivators of the vine. And the fact that our forests here are so full of the native vines, growing in such luxuriance, and producing their wild fruit so abundantly, indicates that our soil, in its varied aspects and material substance, is well adapted to the growth of that fruit.

With regard to the plum, that is one of the fruits that it was supposed we must give up, on account of the curculio, which was thought to be more than a match for us, and that fruit has generally disappeared from our tables. There are but a few places in New England where it is successfully cultivated; but with very little trouble, say two hours' trouble in a year, in caring for my trees, I have been able to obtain a full supply for my family for the last ten or fifteen years, of some dozen varieties of plums in succession, lasting two months. It has been said that you cannot scare away the curculio; that you must catch him and kill him. But if I have not scared him away, I have deceived him away from my place, by inducing him to believe that there was no place for him to lay his egg in the young plum.

The secret of success in avoiding the curculio, is merely to apply to your trees, soon after the calyx falls, or about the time the fruit-blossom falls, some mixture, or some substance,

it may be either in the form of powder or liquid, that shall so affect the curculio that he will avoid the tree. These mixtures are of various kinds. There are two that I have used successfully, and you may have your choice. Take the drainings of the barn-yard, the liquid manure, place it in an old barrel or cask, mix with a few pailfuls of it a pound of sulphur and a quarter of salt, and let it stand awaiting the time for your application. When the flower has just fallen, and the curculio begins his work, take a few quarts of that liquid and reduce it with water to a moderate degree of strength, add to it a quantity of ashes that will make it about the consistency of cream, and with an old wash-basin or a broom, drench the top of the tree. If that is not washed off by a succeeding shower, one application is sufficient for the season. If showers succeed, repeat the operation two or three or four times, and your trees that have lost every specimen of fruit before will come to the harvest loaded with plums.

Mr. Flint. How about the black knot on the plum?

Mr. Gold. That is worse than the curculio. I will give my other prescription for the curculio, and then I will tell you how I have been able to get along about the black knot, although it is a very serious matter with me. The other prescription is this: mix some tar with soap, and boil it up in an old kettle; dissolve that in water, and use the liquid, if you please, with a garden syringe upon your tree. That is a perfectly effectual remedy. It is an improvement upon my plan, suggested and acted upon by Dr. Howe, of Connecticut, the inventor of the pin-machine, a gentleman who may be known to some of you as an enthusiastic cultivator of fruit, as he was a successful inventor in machinery.

Question. What kind of tar do you use?

Mr. Gold. I use pine tar; I mean the product of the pine-tree,—common tar, not coal tar.

With regard to the black knot, my only remedy has been to cut it off wherever it appeared, even if it resulted in destroying the whole tree. Often I have had to cut down trees; sometimes to cut off half the top. But do it thoroughly. Do it on the first appearance of the disease, and do it regularly. But to show that it has not been altogether

destructive to my plum-trees, I will state that I have one still standing that I planted when I first began fruit-culture, thirty years ago, that I bought of the lamented A. J. Downing, the nurseryman, at Newberg. It is still left upon my grounds, although large limbs had to be cut off on account of the black knot. But by planting others, from year to year, in place of those I have been obliged to destroy entirely, I have been enabled to secure a full supply.

With the peach, I have met with no measure of success upon our hills; but I have shown my faith, in the hope that I may yet be successful, as some have been in other localities, by planting two hundred trees last spring, to test the question pretty thoroughly, upon a locality that I thought as likely to escape the effects of our severe winters as any other that I possess.

QUESTION. High or low land?

Mr. GOLD. High land, sir. My elevation is twelve hundred feet above the level of the sea.

QUESTION. North or south inclination?

Mr. GOLD. It has a south-west inclination, sheltered from the east and north winds by woodland, but a high elevation.

QUESTION. How about the yellows?

Mr. GOLD. Well, sir, I said I have had no success with the peach. I have known some orchards to be abundantly successful. But that is a disease that is beyond our knowledge, I think, as to the manner in which it spreads, and our power to avoid it. I am unable to give any advice upon that subject, having had little practical experience.

With regard to the apple, I have planted several orchards, and have sought to place them in different locations upon my farm, and under different conditions, that I might have fruit every year. I have not resorted to removing the blossoms or the fruit-buds, as it is a somewhat recent suggestion of our fruit-cultivators that that will give us fruit every year; but I have resorted more to a liberal feeding of the trees, and to planting a considerable number of varieties in different exposures. With trees planted in that way, I have secured a very fair and uniform crop of fruit from year to year. I am called to account for it, to know how it is done. I have no secret at all in the matter. I do not know myself, except

in so far as pursuing that course, such has been my success. This year, a few varieties were uncommonly beautiful and perfect,—remarkably so,—and yielded abundantly. The old Westfield Seek-no-Further, upon such trees as I had, gave me one of the finest crops I have ever seen of the fruit, in its most perfect form. The Hurlbut, which is a new variety, that is cultivated extensively in Berkshire County and in Litchfield County, originating in Litchfield County, is a tree, also, that bears abundantly every year, but especially has it favored us in the odd years; and it is a fruit that we commend for planting, from the rigorous growth and hardihood of the tree, its abundant bearing, and the quality of the fruit. I think it must become one of the favorite fruits of New England.

Mr. Flint. Do you ever wash your trees with potash?

Mr. Gold. I use a solution of soda to wash the trees, in preference to potash. You cannot get it too strong; but I have been afraid that I might get a solution of potash too strong. For the scale-bark insect, I have put it on in the spring, just before the leaves put out, just as the scale-bark insect is beginning to start on his travels for the purpose of propagation. He seems to be particularly susceptible to its influences at that time. With regard to the borer, the directions were to dig him out with a wire. Washing the trunks of the trees with some mixture that will discourage the insect from laying its eggs I have found easier, and perhaps better.

A word with regard to this curculio remedy. You should not put the ashes in until you get ready to apply the ammoniacal or nitrogenous liquor to the branches of the trees. That immediately develops the ammoniacal odor, and it is that that we wish to disseminate through the tops of the trees. Therefore, do not add your alkali until you are ready to apply it.

With regard to a wash for the trunks of the trees, one made of soap, tobacco-water and fresh cow manure, mingled to the consistency of cream, and put on early with an old broom, and allowed to trickle down about the roots of the tree, has proved with me a very excellent preventive of the ravages of the borer, and a healthful wash for the trunk

of the tree, much to be preferred to the application of lime or whitewash, which I have often seen applied, but which I am inclined to think is not as desirable an application as the potash, or the soda, or this mixture of soft-soap and manure.

With regard to the height at which trees should branch out, we were taught, a few years ago,—and it was considered to be a heresy to say anything else,—to let them branch very low indeed, and I have seen the practice carried to the extreme of letting them branch within a foot or so from the surface, spreading out their limbs. What has been the result? The result has been, that the fruit produced by those lower limbs has been wanting in color; there has been additional difficulty in gathering the fruit; and I believe now that our cultivators unitedly would say, "Give your trees a reasonable height to the head, depending upon the variety very much, to allow of culture beneath the branches, and of free circulation of air beneath the tree." Some trees very soon spread over, and the limbs will reach the ground. The Rhode Island Greening, for instance, if you branch it as high as your shoulder or your head, in fifteen years the limbs will reach the ground. That is low enough, certainly; you do not want them any lower than that; and if you allow it to branch out still lower than that, you have no opportunity for the circulation of air below the tree, and your fruit, growing so close to the ground, will be spotted, or will be of imperfect color. There is nothing to be gained by allowing them to branch out too low. Other varieties, like the Northern Spy, which send their branches straight up, will bear to branch out lower. The Northern Spy has shown, within a year or two, that it is not quite so bad a tree for New England as we thought. It comes very slowly into bearing. They were planted among our orchards about fifteen or twenty years ago, and did not answer our expectations; but a year ago, and this year, I have seen trees with their ladder-like tops leaning over in the most graceful and willow-like form from the loads of fruit they were producing. I am inclined to think that, as the tree gains a reasonable amount of maturity here, with good culture, the Northern Spy will reward us with those abundant crops for which we have been looking.

Question. In what locality is that?

Mr. Gold. Well, sir, a year ago I saw some of those trees loaded with handsomely colored fruit in Fairfield County, Connecticut. It was most elegant, the way they had spread over.

Mr. ———. I was in hopes you could locate it near this county. I have got a lot of them, and they do not bear.

Mr. Gold. Well, sir, different varieties of trees are eminently suited to different sections of country. It would not do to get up here and recommend an apple because it thrives in one section of the State. That may be so, and yet the tree not do at all well in another location. I think I have heard the Fameuse or Snow-apple spoken of as not maturing in Massachusetts. It is the apple which, in my family, is placed at the head of the list as a desirable dessert apple. Nothing can surpass it in its delicacy, flavor, tenderness, and all those qualities which make it a pleasant apple for the family; and still, I have eaten specimens brought from the West, that were so wanting in delicacy that I could hardly recognize the fruit. The Roxbury Russet, with me, and generally in Connecticut, is being discarded; it is so attacked by the apple-worm that its planting is not now encouraged. I have succeeded in keeping out the borer, in a reasonable degree, in driving away the curculio, and destroying the caterpillar, and my next attempt will be after the apple-worm, an insect that eats into the core of our apples; and from the accounts that are given of the opportunities for circumventing it, I believe it will not be difficult. Bands of straw or hay placed about the tree, and taken down and burned or destroyed at intervals, are said to be effectual in destroying thousands of the millers that lay the eggs, of course protecting the fruit. But the only success that I have had against that insect has been in pasturing an orchard. My orcharding is done upon hilly land; that is, not sufficiently level to admit of continuous culture for a series of years. It is not sufficiently inclined to prevent culture as long as the soil is full of vegetable matter. As long as the turf holds the particles of the soil together, I may cultivate safely for a few years; but if I continue the culture after that matter has ceased to hold the particles of the soil together, the washing will be such as to seriously affect the value of the land, and remove the fertility from the

higher lying portions of the field. Therefore I am of necessity obliged to keep my orchards more or less in grass, and if in grass land, how are they to be treated? Top-dressing, if in meadow, is a necessity; but pasturing seems to be a better application for keeping up the fertility of the soil, and also for destroying the apple-worm, in one stage of its progress. An orchard which had arrived at maturity and was going to decay, was turned by me into a cow-pasture, and my herd of cows resorted to it as a favorite place to spend those leisure hours of the day which Dr. Loring has so beautifully described as better spent in busying themselves in gathering herbage; but nevertheless, they have sought to spend their days beneath the shade of those apple-trees, and they have picked up every early dropping apple, from the smallest size, until they attained maturity in September, when we have been obliged to close the orchard. The result has been an increased vigor in those trees, and a wonderful improvement in the quality of the fruit produced by them. The operation has now been continued about ten years, and this year my men remarked with regard to that orchard, that they had the most beautiful Greenings there they had ever seen; they were perfect. Another orchard I devote to the pasturing of sheep, which I consider preferable to cattle to put in an orchard, and would recommend them. With regard to swine, I have tried those in my orchard, and they did very well, but they did a little too much, sometimes. They went a little too deep, and in default of something else, laid hold of the roots, and it is a little dangerous sometimes to turn many swine into an orchard. It should be allowed with caution. But I believe with the help of these, our country friends,—our cattle, our sheep, and our swine,—and with a little of that prudence and care and skill that we must exercise to farm it successfully here and in Connecticut, we can raise fruits successfully; and then look at our advantages in transportation over the Western farmers! Have you ever thought what it costs those Western men to get their crops to market? I bought a car-load of bran that cost me twenty dollars, and I knew how much the Western miller got for his share. How much the farmer got for the grain, I never knew, but the miller got eight dollars a ton for that car-load; the bran cost

twenty dollars here, and I imagine the farmer's share was pretty small. Now, when they send their apples here to compete with us, do they get a very large share of the cost at which they are sold? I think that the man who handles them, and the railroad that transports them, lay so heavy tariff upon them, that we can well afford to fight these our insect enemies, and to apply the necessary fertilizers to keep up the vigor and fertility of our orchards, and that we need not fear the competition of the West.

QUESTION. How can we prevent the ravages of mice? We suffer more from mice among young trees than from all the other things you have named. What is your remedy?

Mr. GOLD. I planted an orchard of eight acres last spring, and this fall I have built a mound of earth, about the size of a half-bushel, around each tree, directing the man to stamp it down with his feet and smooth it off a little in the shape of a flap. That will serve to protect the tender roots of the tree, and keep it from being swayed about in the winter and spring; and I expect it will be a perfect preventive of the ravages of mice. It has hitherto proved so, whenever I have had young trees enough to make it an object to bank them up in that way.

QUESTION. I would like to inquire in regard to the most favorable season to prune apple-trees?

Mr. GOLD. We are advised to prune in June, but as that is a time when a farmer never will prune his trees, we accept what is considered to be the next best time, which is the mild weather in winter. Any time from this time onward during the mild days of winter is considered the best time for pruning an apple-tree. But the pruning should be so frequent that very little pruning will be needed. Careful foresight in pruning will prevent the necessity of cutting off large limbs, which is always injurious in its effects upon trees.

QUESTION. Will it do any hurt to prune them on a cold day?

Mr. GOLD. I don't suppose it will hurt them particularly to do it in a cold, but pruning is an operation that a man cannot perform unless he is perfectly comfortable. If he is uncomfortable, from cold or otherwise, he is not to be trusted in a tree. He must take his work easy, and if he can get up

into an apple-tree when the weather is very comfortable about him, he will do his work very nicely. I know it is said that we must not cut a tree when the wood is frozen. I have noticed that if you cut scions when they are frozen, you will break a little of the wood, and that will turn brown afterwards; but still, I have not laid sufficient stress upon that to avoid pruning at that time, if the men could be perfectly comfortable.

With regard to pruning, all the suckers about the roots should be cut off the first time you see them,—the sooner the better. They should not be tolerated at all. With young trees, pruning may be practised at almost any season of the year with advantage; but when trees have attained some considerable size, you must have a time for it, and I know no better time than the mild days of January and February.

Question. What variety of plum do you consider the best and most profitable?

Mr. Gold. The Green Gage is the favorite with me, as being unsurpassed in quality. The Imperial Gage is a better bearer and a larger plum.

Question. Are there not some varieties of plum more exempt from black knot than others?

Mr. Gold. I think there are. The Green Gage seems to be as exempt as any other, although not perfectly so. I have had a good many varieties.

Question. Do not trees in a bearing state appear to have more of it than before they bear?

Mr. Gold. I know that idea has been advanced, but it has not been borne out by my experience. Young shoots that spring up from the roots are affected by it, that never have blossomed.

Question. Will the Green Gages reproduce without budding?

Mr. Gold. I have usually budded my trees, or propagated them, from the suckers that come up from the roots. Some varieties that I have send up a great many suckers, and I graft or bud upon those.

Mr. ———. There is a species of Green Gage in this vicinity that reproduces, and is very free from the curculio and the black knot.

Mr. Ordway. I wish to take issue with the gentleman on pruning trees. He says June is the best time, and I agree with him there. He says that farmers never trim at that time of year, and he is generally correct in that idea. But when he says trim at this time of year, or any time during the winter, he is decidedly wrong in that respect. If you trim a tree in the fall of the year, at this time, or any time during December, January or February, and go to it in May or June of the year following, and take your thumb and scratch upon the bark where you have taken a limb off, you will invariably scratch off dead bark of the thickness of an eighth or quarter of an inch. All the bark would have grown, if you had cut it off in April, May or June. I tried that in my orchard in 1856. There were some places where I cut off a limb that the bark died back a quarter of an inch, which had never been known when the trees had been pruned in the spring or in the summer. It is a mistake to trim your trees in the winter, and it is a mistake to head in your trees in the fall; they will die back just as surely as you do it. If you cut off a limb as big as your finger with your shears, that limb will die out. I never saw a case where it failed to do that.

Something has been said about apple-trees bearing the odd year. What time of year does a tree throw out its fruit-buds, to make the blossoms? Can any man say that he can tell? When does the fruit-bud form? It forms during the growth of the tree. Where the canker-worm gets on it, he leaves about the 18th or 20th of June, and your tree hardly ever grows much after the first of July,—hardly ever, it does sometimes; and the canker-worm will take the growth of the tree, destroy its foliage, and destroy every particle of fruit, if you have the canker-worm as thick as I have them; but the moment he is gone, the tree starts a new life, it makes a growth, if you have good ground, and you get your bud. Therefore you change the bearing of your tree, if this happens to occur upon an even year. As long ago as I can remember, my father had a Baldwin tree that sent out two branches from the bottom, and one side bore one year and the other the other, just as regularly as the years came round. That was in West Newbury. The fact became known, and trees were grafted with scions cut from those two branches, and

one side of those grafted trees bears one year and the other the other. There are hundreds and thousands of trees that have been grafted from that old tree. Almost every man in Bradford and Haverhill, and all through Essex County, has got them; and they have gone beyond Essex County. It is a fact that some Baldwins will bear one year and some another, and you can change the bearing year by picking off the fruit-buds, I have no doubt.

I take issue with the statement that we can do as well by setting out the Northern Spy as we can with other varieties. In 1849 I set out six out of a hundred and thirty Northern Spy trees that came from New York. I have cultivated those trees on good land. I have grafted even five of them, leaving one, in hopes that it might do something. It spreads forty feet, with an upright form, but I never saw the time when I had a barrel of app'es on that tree in one year, and those I did have were so knurly that you could hardly put them in your pocket without wearing it out. It is no use to try to raise such kind of fruit in Essex County. They have them in Connecticut, no doubt. The gentleman says, "Hold on!" I have been holding on since 1849, and I do not get any fruit. You may trim it every year, and take splendid care of it, as I did, but you will not get any fruit. What am I going to do? I say, graft them over, or dig them up.

We have an apple here that does first-rate in this locality. Some call it the Hubbardston Nonsuch, but it is not so big as the Hubbardston Nonsuch. It is what is known by farmers, more particularly down in the eas'erly part of Essex County, as the Ribstone Pippin. It is a splendid apple, and, raised anywhere in Essex County, it has a better flavor than the Hubbardston Nonsuch. It is one of the best apples I raise, and it will grow thicker than any other tree, almost, and throw out more fruit-buds; and if you do not have fruit-buds, you will not be likely to get many apples,—that is, here.

As far as the Rhode Island Greening is concerned, we cannot do anything in this locality with that, or with the Russet, either. I have got nice Rhode Island Greening trees standing in good land, and I have never got from them more than a tenth part what they ought to bear. You cannot grow the Rhode Island Greening in Newbury, or Beverly, or any-

where that way. You cannot get Russets, either. There are exceptions, I know; but that is the general fact. I have dug up sixteen or twenty nice Russet trees, as good as anybody grows. I have got lots more of them. I guess I have got four or five barrels that I picked from five or six trees, and I made out to get one barrel for my own family. I could not sell the rest to anybody. They were not worth putting into the cider-mill.

JOHN B. MOORE, of Concord. It is a matter of importance to raise seedling fruits adapted to our several localities. I have noticed, in what has been said here with regard to apples, that Mr. Gold, of Connecticut, has spoken of certain varieties that do well out there. The gentleman from Essex says they will not do anything with him. Now, that is perfectly true. An apple that will grow well here in Eastern Massachusetts, will not do anything, for instance, in Berkshire County. And here is another fact which you will find to be true, if you examine into the matter carefully: that an apple which originated on a cold, wet soil, will be very sure to do well on any soil that you have a mind to plant it on; but an apple that originated and comes to perfection on a warm soil, you may be just as certain as that you sit in those seats, will not produce anything better than carrots in a cold, wet soil. That is known to be a fact, from very careful observation.

Now, in regard to the Hubbardston Nonsuch: I have had the curiosity, among other things, to go and see the original tree, which is standing about four miles from the centre of Hubbardston, on the western slope of a piece of very cold pasture-land, in an orchard of about half an acre of natural fruit-trees. That tree is some sixty-five or seventy years old. The top is decayed and broken off, but branches are starting out, and two years ago, it bore two or three barrels of very good apples. That is one instance. That tree originated on a cold soil. You may put a Hubbardston Nonsuch tree on any soil where an apple-tree will grow, and it will bear apples. You may put the Baldwin in that cold soil, and it will not produce any apples, or but very few. You may take as another illustration the American Golden Russet, about Boston, which is not the true American Golden Russet. The conical-shaped apple, with a red cheek, which is sometimes called the American

Golden Russet, is really the Hunt Russet. The American Golden Russet is an apple that should ripen, if the descriptions in the book are correct, in December, and the Hunt Russet is certainly as late as February or March. That apple originated, undoubtedly, in the town in which I live, some 200 years ago. There are trees in that town now, that an old gentleman, who would have been 102 or 103 years old had he lived until now, told me, some twenty years ago, his grandfather planted, which are still bearing apples. That originated on a warm soil, and the trees will not produce anything on cold, wet soil. That is the Hunt Russet. There has been a good deal of confusion in regard to the Russets. The Hunt Russet is a conical apple. The Roxbury Russet is flat, and, unless it grows in the sun, with no brown color, and it is usually covered with a greenish russet, and holds on very late in the spring. Except for its late keeping, it is a very poor apple. It keeps late, and that is the only desirable point it has, in my judgment.

Now, I say, speaking of the desirability of raising fruits adapted to your climate here, I do not think you can find a New York apple or a Western apple that is really a success in Massachusetts. I do not know of one. I have a few trees of the Northern Spy, and like the apple very much. After it has attained the age of twenty or twenty-five years, it will set fruit enough, but the coddling moths like that apple so well that they will destroy a large portion of the fruit. When I get a tree full of apples, the fruit is comparatively poor in quality. That remark in regard to Western apples applies to all their other fruits. Take a strawberry originated at the West, and you will find (I do not know an exception) that while they grow large, they will be, many of them, poor in quality. They look at size at the West, rather than quality. Their strawberries do not succeed well here; perhaps ours do not at the West.

Now, I have made some experiments which have been interesting to me, and experiments, too, in regard to growing strawberries. I have, within the last fifteen years, fruited somewhere from twenty to thirty thousand seedling strawberries, and tested them. That is, I found a large portion of them so poor that they would be condemned at once, and

others would be tested further. I have tried hybridization, and with all the talk you had about hybridization, you will find it a very uncertain thing, if you attempt to hybridize the strawberry. When you have taken out the anthers and impregnated the strawberry, and covered it with muslin, you will find that it has been impregnated, in spite of all you could do, with some other pollen that you did not mean to have there. Realizing all these difficulties, I at first went to raising strawberries from seeds, selecting the best berries of the best varieties I could find. The result was, that I grew seedlings for six or eight years without any success whatever. Then it came to my mind what a stupid man I had been, knowing all that time all about the botanical formation of the blossom, knowing the pistillate and staminate varieties perfectly well, not to take advantage of that. Instead of hybridizing, if I had taken a purely pistillate variety, and put it away from other plants, and taken a plant of a staminate variety and planted near it, a cross would have been just as certain as the cross from an Ayrshire bull and a native cow. It could not have been otherwise, because there are no male organs to the pistillate varieties. I got that through my head (only showing you that I was rather thick-headed) after repeated failures in growing seedling strawberries. I will mention one other thing. I took some fine berries of "River's Eliza," which grows very large and handsome fruit, which were growing in the same strips where there were fifteen or twenty other kinds all about it. I supposed it would be crossed by some of the other varieties. I raised three hundred seedlings, kept them separate and distinct from the others, and to my surprise, I got fruit very much like the parent berry, only not so good. After that non-success, I adopted the other plan which I have just described to you, and I found I had just as many varieties as I had plants. Of course, a large portion were poor, but I have raised some varieties that have been very satisfactory to myself, and that have made their mark, undoubtedly.

As I said before, that applies to the apple, to the pear, and to all other fruits. Take, for instance, the pear. Thirty years ago, say, there was hardly a first-rate pear grown here, with the exception of the Seckle, save the imported varieties,

which then were not nearly as numerous as now. To-day, if a person purposed planting fifteen varieties, and relied on the judgment of the best cultivators of pears in making his selection, at least ten of them would be American varieties, all of which have been originated since that time. For instance, take that pear originated by Mr. Francis Dana, of Roxbury, "Dana's Hovey," probably one of the highest flavored, if not the highest flavored, pears in cultivation, and equal to the very best early winter pear. Then take "Clapp's Favorite," which is certainly a good pear, although it has the failing of rotting at the core. Mr. Clapp has one or two other seedlings which have not been put out yet, which are very promising.

You see, therefore, that it is not a hopeless job to undertake to raise seedling fruits, and a person who does it has the satisfaction of doing something for himself, and conferring some benefit in return for what he has received from other cultivators, and he has the satisfaction of knowing that he has done something to aid horticulture.

Now, something has been said with regard to the washing of trees for the borer. I have found, I think, that whale-oil soap can be used successfully for the destruction of that insect. It is a very simple thing; it will not hurt the tree if you put it on its full strength. You can take whale-oil soap and dilute it until it is about as thick as paint, and put a coating of it on the tree where the holes are, and I will bet you will never see a borer on that tree until the new crop comes. I feel certain of it, because I have done it. I think whale-oil soap, mixed in the same way, is one of the best washes; it will not injure the bark. There is danger in the use of potash. We consider one pound to a gallon of water the proper proportions, but I have seen the bark of tender trees injured by using potash water of that strength.

Now, another thing which has come under my observation in regard to the planting of trees. And by the way, let me tell you I have been a nursery-man once, and had a large lot of trees, and if any of you gentlemen propose to plant an orchard of pear or apple trees, I think I can tell you one little thing that will make a great difference to your orchard. If, instead of buying trees of those peddlers who come around,

and whose business it is to cheat the public, as a general thing, you can go to some responsible nursery-man and go into a row of trees from which none have been removed, and take the first pick of those trees, you will get an orchard that will be far superior to any trees after they have been picked over, although you may find just as good-looking trees the second or third year afterwards, in the same rows. The difference is this: If you go into a block of trees from which none have been selected, you get the most vigorous stock, and they become trees quicker than the others, and this vigor lasts through life. It is the vigor they have at their roots, and they are much superior to the others. In fact, after a row of trees has been picked over, I do not think the others are worth much. They would not be to me. They answer to sell. These refuse trees are the ones that are sold by those people who send out agents to get orders from the Massachusetts people.

I do not think of anything else, unless you ask me some questions.

Mr. Ordway. In reference to the apple-worm: what lays the egg that produces the worm, and where is it laid?

Mr. Moore. It is a miller that lays the egg, usually in the calyx of the blossom, or the little apple, when it is just formed.

Mr. Ordway. I do not understand it to be a grub?

Mr. Moore. No, sir. The egg hatches there, and, as I understand it, the worm goes into the apple, perfects itself, and then drops and enters the ground, or crawls under the dead bark. One of my friends used to destroy a good many of them by placing old cloths in the forks of his trees. Towards fall, he would find the cloths perfectly covered with worms, that had crawled out of the apples, and destroyed them. It amounts to the same thing if you pick up the apples and give them to your pigs, or if you grind them into cider, as some people do, and drink it.

Question. I would like to inquire in regard to quince-culture, if it is profitable?

Mr. Moore. I used to raise quinces very successfully; but a few years ago something happened to the trees, and they died on my hands, and I have not succeeded in growing

them since. I have grown peaches pretty successfully the last few years, having about five hundred bushels last year, in a small orchard of about two hundred trees. Of course, you will not get a crop every year, but you will get a crop two or three years out of five. The only difficulty is the yellows, and, as Mr. Gold says, that is a disease which has never been accounted for yet, but I think it is gradually wearing itself out. The peaches that we grow here are much finer than those that come from the south, because they are allowed to ripen on the trees.

Question. What can we do to hasten the running out of the yellows?

Mr. Moore. I don't know. About 1845, I used to raise peaches, and dump a cartload of refuse and poor ones into the pigpens at once; but the yellows destroyed all the trees I had. Finally, after waiting awhile, with some of my neighbors, I planted a few, and lost them. I am informed that this disease started in Delaware, and travelled north at the rate of about fifty miles a year, until it got up here. I found that it was going out, to some extent there, and supposed it was working itself out. I therefore planted two hundred trees more, five or six years ago. Year before last, I got a small crop of peaches; last year, I got a very large crop. I guess we picked off twice as many as we left on the trees, and we left all the trees could stand under. This year, I should have had a good crop, if it had not been for the yellows. That orchard is going up, but I have got my pay for it, so I shall be tempted to plant another next year.

Jacob B. Sweet. It was stated very positively in some of the agricultural papers that wood ashes were a preventive. Have you ever experimented in that direction?

Mr. Moore. Yes, sir; I have put two or three bushels of leached ashes around a tree at one time. I have also used Stassfurt potash salts, and I don't know what I have not tried, but I have never found anything that would stop it. I think that when a tree is once struck by it, the best thing you can do is to pull it up.

Mr. Wetherell. I will state a fact given me by Capt. Pierce of Arlington, which agrees with the statement of Mr. Ordway. He has been more successful in cultivating apples

than any man I know of in Eastern Massachusetts. Capt. Pierce says, "My time for pruning is the first two weeks in June, in ordinary seasons; it may vary a little from that. But," he says (and this is rather a compromise between the views expressed by Mr. Ordway and Mr. Gold), "farmers find it hard to get their wood over the ground in June, and so I have my orchard pruned in this way: I cut off a limb any time I have leisure after harvest, a foot or more from the tree, and let it remain on the ground until I am ready to remove it. Then, in June, I take a fine-cut saw and go through my orchard and cut off all the stumps close to the tree." The final pruning is thus done in June, at the time he considers most desirable, and the wound, he says, heals over smooth and sound, leaving none of that canker to which my friend has referred as likely to follow from cutting off a limb in winter. That is the statement of Capt. Pierce, who, from the success which he has had in the cultivation of the apple, has been called the "King of Orchardists"; and I think his success in regard to pruning has done more than anything else to confirm me in the opinion that June is the best time for pruning the apple-tree.

Mr. Slade. I perhaps ought to state what I know to be a very cheap and efficient remedy for the curculio. I got it from old Mr. Buckminster, and it has proved successful every time I have tried it. Take a tin pan that will hold three quarts, put two or three quarts of leather chips in it, set fire to them, and let the smoke go up through the tree. It will prove an efficient remedy for the curculio. I give that as my experience.

Mr. Flint. How long is it necessary to have the smoke go up?

Mr. Slade. I let the chips burn out. They will burn an hour or two. One application is sufficient. I never tried anything but that. It did very well when I tried it.

I will say one word in regard to pruning. It is important that trees should be pruned. It is better to prune them at any time than not to prune at all. It will be a misfortune if the result of this discussion should be to induce any man to neglect to prune his trees. As I said in the remarks that I made from the platform, I have never had any particular time

for pruning an orchard. In walking through it, if I saw two or three limbs that needed to be removed, the next time I went out, I took the shears and saw, and took them out. But still the orchard has never had a severe pruning, and perhaps will never need it.

Mr. Ordway. One word in reference to pruning in general. The gentleman on the right says, "Trim at any time, and in June take off the stub." I have no doubt every nursery-man will agree with me, that there is no time in the year when you have got to trim with such caution as in June. If you are not very careful in pruning, you are just as sure to start the bark at the lower part of your stub as you live. June is a good time, but July is better. I have had experience all my life in trimming trees, and in grafting and budding all kinds of fruit, and I never saw but one year when I could not trim in April and the first of May. After you get your trees trimmed, mix a bucket of clay and hair, just the same as a man would mix mortar, and rub the mixture over the place where you have cut off a limb, and you will have no trouble. I did that, after 1856, to prevent the sap running down and turning black and killing the bark, and I have never had any trouble since. Therefore, if you trim in June, you must be very careful that you do not start the bark. You cannot put it back and make it stay, and there will be a dead place where you leave it.

Mr. Wetherell. I should have said, use a very sharp saw. That will avoid the evil you speak of.

Mr. Ordway. Here is the point: if your limb turns one way or the other, you are sure to start the bark, which is just as slippery as it can possibly be at that season of the year.

Mr. Hills, of Plaistow, N. H. I am not a Massachusetts man, but I have had a little experience in the management of trees, and there are one or two points which have not been covered by the suggestions which have been made, to which I beg leave to allude. I am perfectly satisfied, that if trees are trimmed carefully, June is the best season of the year to perform the operation, and for this reason: if you trim early enough, before the tree has made its growth, the wound, as I have repeatedly observed in my own experience, will heal over almost completely the first year. I have preferred

this season on that account. It may be said that you may trim earlier than that—in April or May. Well, the disadvantage or danger of trimming in that season is, that a tree trimmed in April or May, before the growth has commenced, will bleed almost as surely as a grape-vine pruned in spring, and the sap will run down the trunk of the tree, and it seems to me that for some cause, I do not know what, that is as poisonous to the tree as anything can be; and when you have got the sap running, you cannot stop it by any application that I have found. It will run, not only that season, but the next, and your tree is liable to be ruined. To prevent this, I have pruned at this season of the year, and I have made an application, not of clay, as suggested by Mr. Ordway, but of gum-shellac, dissolved in alcohol, to about the consistency of molasses.

Mr. Ordway. Will that absorb the wet?

Mr. Hills. No, sir. It will harden in half an hour as hard as glass. It will keep out wet and keep in wet.

Mr. Ordway. If your tree bleeds from the wound, when you cut off a limb, your preparation don't stop the sap running down on the bark of the tree and killing it. Clay will do that.

Mr. Hills. I see now what the idea is. You might as well say that the best application to make after a limb has been taken off by the surgeon, is clay. I do not intend that the wound shall ever bleed at all; I mean to tie it up at once. For that reason, I should never think of pruning a tree on a wet day, and I would caution everybody against it. Take a good bright day, and a mild day, when the tree is dry, and everything is dry. The most convenient way I have found of using the preparation is to fix a sponge on a piece of wire and put it into the stopple of a large-mouthed bottle, which you can fill with the preparation, and when you have cut off a limb, take out the stopple and brush the sponge over the wound, just as you would use sponge-blacking. If it is a bright day, in half an hour it will harden so that you cannot make any impression upon it with your thumb-nail. The sap cannot get out, and it will exclude the wet from the outside. That is the way I would stop its running. I would not recommend that season except for that

one reason. But there is a disadvantage which has not been alluded to here in pruning in June. A tree has then made part of its growth. Everything about it is then in the most tender condition. The wood that has grown has not ripened at all, and if you saw a limb off in the top of the tree and slip it down through, you injure the tree itself; you strip off the foliage of the tree, which you do not wish to injure at all. It is injurious to pull limbs down through a tree when it is making its tender growth, and June is therefore a bad time of year on that account. There is another suggestion, and that is, that a season of the year when the foliage is not on the tree is preferable to any other to cut the limbs, because you can see where to prune better than you can when the tree is full of leaves. You can see what limbs to cut out. You can see what branches are starting from one side of the tree and pushing over to the other, where they are very sure to come in contact with some other branch. A tree should be pruned so that the branches will radiate from the centre, not spread from one side to the other; those are sure to cross after a time.

My idea about pruning is, that it is an unnatural operation. I would never cut off a limb of a tree, if I could possibly help it, any more than I would cut off one of my children's fingers, unless it was diseased. It is all unnatural; but if you find a limb going where it ought not to go, it is better to take it out, and thus prevent its throwing itself across another limb and producing a wound which will result in the destruction of both.

Now, as to the matter of changing the bearing year of the tree. That, I am satisfied, can be done, and in a different way from what has been suggested here. I accidentally learned how that could be accomplished when clearing a piece of nursery ground which had standard trees set in it, late in the season. The nursery had been pretty well sold, and at the end, there were so few trees standing, that I thought it advisable to clear the ground, put it in condition, and let the standards take up the whole ground. I did so, soon after the spring sales were over, and the trees that remained were nearly worthless, and most of them, I presume, were put into the brush-pile. Then I cultivated the ground, and applied

my manures as late as June. Any one who has had any experience in this matter of fertilizing trees will know without my telling him that manures applied at that season of the year will not produce any immediate effect upon growth. If you apply manures in the fall, you will see the effect upon growth the earliest day in the spring; but if you apply manure in May or June, or the first part of the season, you will see no effect of it at all that year. I saw no effect from that manure until the time when the trees would ordinarily commence their second growth. Then I could see the effect of the manure and cultivation; but the season was so far advanced that they only made a small growth. The next year happened to be the odd year, and then I got a good crop from the Baldwins.

With regard to the Colorado beetle, one plan that has been recommended for getting rid of them is, by picking them off with the fingers. If anybody has nothing better to do they can attend to that; but I prefer the form I have suggested.

Pres. CHADBOURNE. I have experimented for three years, with all the means at my command, in various ways, and I found that picking by hand was the cheapest way of conquering the Colorado potato-beetle. You can do it for five dollars an acre, out in Wisconsin, where there are millions and millions of them. So that it is not always safe to argue theoretically.

Now, I want to inquire in reference to this matter of the alteration of the year of bearing. I see there are a good many gentlemen here who have studied apples carefully, and I hope they will be able to enlighten me in regard to something which I do not understand. I used to think that the bearing year might be changed by some of those processes which have been described, before I observed this fact, that the effect of the "odd year," as we call it, is universal. That is what troubles me. Take last year, for instance. All the apple-trees, wherever I went in New England, all through our region, no matter when they were set out, or how cultivated, were loaded down with apples. This year, those same orchards, no matter when they were set out, or how cultivated, were almost entirely barren of fruit. What I want to inquire is, if there is not something in the year itself

which affects the apple-trees, as there is something which affects the potatoes and makes them scabby, certain years?

Mr. Hadwen. Having had some little experience with the odd-year-bearing apples, perhaps I may be able to answer the question. In the year 1843, when I was at Newton, I noticed that some of the Baldwin trees, more particularly, were not in bearing, and some of them were. I inquired of the proprietor of the grounds, and he informed me that the trees which were then in bearing were the odd-year Baldwins, and the next year the other trees would be in full bearing. After that, I planted some seed for the purpose of raising my own apple-trees, and went to that place and gathered buds from the odd-year-bearing trees. That was in the year 1843, and since then I have had ample time and opportunity to test the result. The result is, that those trees still continue to bear the odd years. But a gentleman inquired in regard to other varieties bearing the odd year. I have on my farm a tree which has two large branches, branching off in different directions, and I have had an opportunity of noticing that tree since 1844. The odd year, one of those branches is invariably full of fruit; the even year, the other branch is full. I have also other varieties of apples that bear the odd year. Some of my Hubbardston Nonsuch trees always bear the odd year, and others bear the even year. The tree I just spoke of, that had two branches, is a natural fruit, but a very good one. The cause of this difference is of course beyond my knowledge. I simply know the fact, that where a tree gets into the habit of bearing the odd year, it will continue to do so.

Mr. Sweet. I think this matter of pruning trees is an important one. I have had a little experience in that direction, and for convenience' sake, perhaps, more than any other reason, I have done what pruning I have done from the middle of April to the middle of May. In years past, being rather pressed by business, and perhaps a little slack withal, I let my trees grow a little out of shape,—let them make large limbs, so that when I did see fit to trim, I had to give them what you call a severe pruning; and I did that at the time named,—anywhere from the middle of April to the middle of May,—and I have never detected any such bad results as those described by the gentleman on the right. I

was told at the time by some one that it was not a good time to trim, and so I took particular notice to see whether there were any injurious effects. As far as I have observed, they have yielded as well as any trees I have seen.

There are a good many reasons why we should trim earlier than June. If you undertake to trim in the middle of June, your grass is coming to maturity, and the wood you cut off will trouble your mowing-machine. As far as time is concerned, no farmer can do it better than at the time I have suggested. The sap is just starting, and the wound begins to heal over soon.

In regard to the varieties of apples, I think my opinion and that of Mr. Ordway are a little different in regard to the Northern Spy. My judgment is, that a bushel of Northern Spies is worth more than a bushel of any other apple that grows. I think they are the most splendid flavor of any apple I ever tasted. I set out only two trees, with some others, in my little orchard, not knowing anything about them, but they have done very well, and are doing very well now, for trees of their size and age.

Another thing I want to say: I repudiate the whole family of Russets, from beginning to end. I would not give a picayune for all the Russets in New England. Talk about your "Hunt's Russet," and your "Black Russet"! A man set out some trees he called the "Black Russet," a number of years ago, and he never has had a bushel of apples from them since they were set out.

Mr. ———. Last year, I had nearly a barrel of Hunt's Russets, which were the handsomest and best apples I ever put into my cellar. I had them this year as late as August. They were full flavored, and some of the best fruit I ever ate at that season of the year. I would rather have one of those trees than any Northern Spy I ever saw.

Mr. Ordway. I cannot let this matter of pruning go by without saying a little more. I say that any man who applies anything to a tree where a limb is cut off, if it adheres to the tree so that the sap shall not flow, it must kill the tree to stop it. For instance, I have grafted as many trees, probably, as any man, and I have had great experience in that matter. I have used what they call wax in grafting. I say no man can

make a preparation to put around a graft, to keep the weather from it, through which the sap will not run, if the tree has any vigor to it that will keep it alive, and make the bark look black around the limb. If you have a preparation to apply to the place where you cut your limb off, you have got to destroy the life of the wood somewhat. Now, sir, oil, or any preparation of grease of any kind is injurious to live wood. There is no man here who will not say that any kind of oil or grease is injurious. Your preparation for grafting is made of beeswax, tallow and rosin, and when the hot weather comes, it is exposed to the sun, and the bark around the top of the stub in which you set your graft the next year will be partially dead, and it will scale off like the bark on the butt of the tree. I have seen hundreds of thousands of stocks in the same way. I have followed this for years, and most of my grafting has been done in the neighborhood of West Newbury, where they raise as much fruit as anywhere, and I say no man can put anything upon live wood that will stop the flowing of sap, unless he puts on clay to absorb it. That is what you have got to do. Clay with hair mixed with it will take up the sap pretty well. Rub it right on, and the sap that comes out is absorbed. I can get more growth in one year from grafted trees by the use of clay than you can get in two by the use of wax. I used wax for years before I found out that it was a mistake to use it, and that I had better use clay. I was up in Brentwood about a fortnight or three weeks ago, and a man showed me an apple-tree that he had pruned some two years ago, and he said it bled, and he applied red paint to it. I took out my knife and scraped the bark right off where the paint had killed it. You will see, if you look around among the orchards, that some men apply red paint after pruning, or, if they happen to have white paint, they will put that on. It is injurious to live wood, anywhere and everywhere.

Mr. Hills. I rise simply to say that I do not wish to be responsible for anything that I have not said. I have not advocated the use of wax, or paint, or anything of the kind, to the wound on a tree. I do not know whether the gentleman intended his remarks for me or not. The preparation I recommended was a preparation of gum-shellac and alcohol,

mixed to the consistency of molasses, and put on with a sponge. I understand the gentleman to say that you cannot put on anything that will stop the flow of the sap, but you must absorb it. The preparation I use is precisely the preparation that a painter would use in coating over the knots in the wood, before painting, to prevent the sap from coming out of the knot and showing through the paint. Now, I beg the gentleman's pardon when I say, that you can apply that preparation to the wound of a tree and prevent the flow of the sap, without any injurious consequences. The result will be precisely this: when the tree commences to make its growth, of course the new growth will push between the bark and the wood, and begin to heal over the wound. If you saw off a limb of a tree in June, and put on this preparation of shellac and alcohol, it will harden in half an hour, and the new growth will commence to push out and form over this wound, and you can see this preparation on the part of the wood that is not coated over just so long as it remains uncoated. It keeps out the wet and keeps in the sap, for the time being.

Now, some do not understand the effect of pruning in the spring. Prof. J. G. Hyde, of Exeter, invited me out, some years ago, to look at his orchard. He had selected the trees with the best judgment and greatest care, and paid an extra price for the first pick of a nursery that I knew well. I went out and looked at it, and found it had been pruned in the spring before the leaves started, and the sap was running down from every wound. He said, "Can you tell me the cause of this?" "Yes," I said, "you pruned the trees at the wrong season of the year. You pruned them before there was any foliage to absorb the sap as it was flowing up." I saw that orchard five or ten years afterwards, and it was literally ruined, only a few of the trees remaining. It was absolutely ruined by pruning at the wrong season of the year.

I do not know as I was understood in regard to the time of pruning. I do not recommend pruning in April; I do not recommend pruning in June. That is, I do not recommend that as the time to take out large limbs. But the method suggested by Mr. Wetherell, as the one practised by Mr. Pierce, I do approve of and practice. That is, in the fall,

after the leaves have fallen, or on pleasant days in the winter, I go through my orchard with my saw; see what limbs ought to come out, and saw them off eight or ten inches from the tree, and carry them to the brush-heap. I can then see just what wants to come out. Then the next June I go round with a sharp saw, and carefully saw off the stumps, and coat them over in the manner I have described.

Adjourned, *sine die*.

CATTLE COMMISSIONERS' REPORT.

To the Honorable Senate and House of Representatives of the Commonwealth of Massachusetts.

The facts concerning the condition of the cattle of the State, and the prosperity of our interest in stock husbandry, as reported by the Commissioners on Contagious Diseases among Cattle, for the year 1874, are substantially true respecting those interests for the year 1875. Although severe losses have been suffered by stock-owners in other States and countries, by the prevalence of contagious disease in their herds, we have been, in a great measure, exempt. The Spanish fever, or "Texas cattle disease," which, in 1874, created great alarm and much loss in some sections of the State, has been again imported to us, in the same manner as in that year, and with similar results. About the first of September, the Commissioners were notified by the selectmen of the town of Cheshire, in Berkshire County, of the prevalence of an apparently contagious and fatal disease among the stock of that and the adjoining town of Lanesborough. Soon after, like information was received from the town officers of Plainfield, in Hampshire County, and of Hawley, in the county of Franklin. As the case appeared to be of sufficient importance to justify some action on the part of the Board, Dr. E. F. Thayer, of the Commission, visited the town of Cheshire on the 7th of that month, for the purpose of making an investigation of the case. In company with the selectmen of the town, he examined a herd of cattle belonging to William Ingalls, and found several of them severely sick, and quite a number had already died. By the examination of both the

sick and the dead, it was conclusively ascertained that the disease was Spanish fever. A subsequent examination of two herds in Lanesborough, one of which belonged to Mr. H. A. Noble, and one on the farm of Mr. Cannon, of Tyringham, the same disease was found, with symptoms and results identically like those of this disease described in our last report. In that report we called the attention of the legislature to the character of that disease, its origin, and the manner in which it reached and was disseminated among our home stock. The examination we have made of the case the present year, discloses the fact that some of our stock-dealers, influenced only by motives of cupidity, and regardless of the general good, have disregarded the teachings of our former experience, and deliberately brought to and scattered through certain sections of the State, that class of cattle which alone communicates this disease. It was found that, in all the towns named, the disease was contracted by their home stock from Texas cattle, recently from the South-West, bought in Albany by drovers, and driven in various directions through our western towns, to be sold to butchers. If such animals were transported by rail to Brighton, and were taken directly to the abattoir for slaughter, little harm would result. But when driven from town to town, or when brought in contact with cattle kept on our farms for dairy purposes, to fatten, or for work, the most serious results are sure to follow. As we, in our last report, called the attention of dealers in stock to this important matter, and urged upon them the propriety of refusing to deal in such cattle during the warm season, and without preventing a recurrence of the acts complained of, we deem it our duty to recommend measures which shall be effectual in protecting our cattle and their owners from a repetition of the calamity. As was recommended by the national convention, held in Springfield, Ill., in 1868, to consider this subject, all of the Western Border States have enacted laws which are rigidly enforced, and which forbid, under heavy penalties, the bringing of Texas cattle into their territory during the warm months. These laws have given them effectual protection from the disease. But the extension of railroad transportation to the far West enables Western drovers to shun those States, and to put that class of

cattle down here, making Massachusetts virtually a border State, and entailing upon us the disastrous results. In this emergency, as a measure of self-interest and protection, the Commissioners would earnestly recommend to the legislature the enactment of a law forbidding all persons to bring into this State any Texas or Cherokee cattle, between the first day of June and the first day of October, and with such provisions that the same may be effectually enforced.

LEVI STOCKBRIDGE,
L. F. THAYER,
Commissioners on Contagious Diseases among Cattle.

BOSTON, January 6, 1876.

ANNUAL MEETING OF THE BOARD.

The Board met at the office of the Secretary, in Boston, on Tuesday, the first of February, 1876, at twelve o'clock, His Excellency, Governor RICE, in the chair.

Present: Messrs. Baker, Bates, Bennett, Dwight, Graves, Goessmann, Hadwen, Hawes, Holland, Kellogg, Knox, Ladd, Loring, Moore, Perry, Peirce, Phinney, Rice, Saltonstall, Sargent, Sessions, Shepley, Stone, Vincent, Wakefield, L. P. Warner, W. L. Warner and Wilder.

The reading of the records having been dispensed with, a committee, consisting of Messrs. Wilder, Kellogg and Saltonstall, was appointed to consider and report upon the order of business.

The committee subsequently submitted the following report:—

1. Reports of Delegates.
2. Report of Committee on Agricultural College.
3. Reports on Subjects assigned for Essays.
4. Miscellaneous Business.
5. Appointment of Delegates.

MARSHALL P. WILDER.
LEVERETT SALTONSTALL.
E. H. KELLOGG.

The report was accepted; when, reports of delegates being in order, Mr. Hawes reported upon the Middlesex Society; Mr. Vincent upon the Worcester; Col. Wilder upon the Worcester West; Mr. Perry upon the Worcester South-East; Mr. Kellogg upon the Highland; Mr. Holland upon the Hampden; Mr. Shepley upon the Union; Mr. Dwight upon the Franklin; Mr. Stone upon the Deerfield Valley; Mr. Bates upon the Berkshire; Mr. Graves upon the Hoosac Valley; Mr. L. P. Warner upon the Marshfield, and Mr. Sessions upon the Worcester North-West and the Hampden East.

Col. Stone was appointed a committee to examine and report upon the credentials of new members.

The report of the Examining Committee of the Agricultural College was then presented and read by Judge Bennett.

REPORT ON THE AGRICULTURAL COLLEGE.

The undersigned, Committee to examine the Agricultural College, have attended to that duty, and made two official visits to that institution during the past year, one at the annual public exercises in June, and another in January just past. On each occasion they were deeply impressed with the value and importance of a scientific agricultural school, and an experimental farm, such as we there possess, and of the general success with which the same has been managed. They desire also to express their high appreciation of the scientific experiments made there, and its importance as a permanent scientific station.

The reports of former committees have sometimes dwelt at length upon the annual operations of the institution, but as these are given so fully in the recent report of the president, already promulgated, it seems unnecessary to repeat the story here.

One important fact stated in that report had already attracted the attention of your Committee, and seems to call for careful consideration; and that is, the financial question. It appears that the income of the institution, from all sources, does not equal the annual expenses by several thousand dollars, and

that the trustees have already incurred a debt of $20,000, to meet the deficit. The longer the present system continues, of course the greater this deficit will become; and apparently it can be extinguished only by a new legislative appropriation, or by private munificence. The present time does not give much encouragement to confidently expect either. The Committee therefore thought it not unworthy of consideration how the expenses of the institution can be safely diminished and the receipts increased.

The "leading object" of the College is, as its charter declares, "to teach such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes, in the several pursuits and professions of life." From this it seems that the primary purpose was to give to farmers' sons and others of the industrial class such useful and practical training as would best fit them for their contemplated pursuits in life. Other branches of scientific and even classical study might also be pursued, but apparently they were, in the mind of the legislature, but auxiliary to the main purpose of this particular school. Without saying whether one course of study is more or less important as a general rule in society, this institution was not founded as a classical, a medical, or a theological school, but simply as an *agricultural* college.

If retrenchment, therefore, is necessary in any particular department of the institution, it seemed to your Committee deserving of consideration whether it should not commence with the less vital parts of the system, and whether the professorship of mental, moral and social science, and that of veterinary science, could not be temporarily dispensed with, at least until the institution was on a stronger foundation.

The Committee make this suggestion the less reluctantly, since in their opinion the studies pursued under these instructors are not absolutely necessary to the practical education of the agriculturist, and the time thus spent could be profitably devoted to other pursuits.

AGRICULTURAL SCHOLARSHIP.

2. How can the income be increased? One method would be to require every agricultural society in the State, which

receives the bounty of the Commonwealth, to maintain at least one scholarship at the College. This would at once secure more funds and more scholars, both of which are absolutely essential to a school. The present buildings will accommodate many more pupils, and no additional expenses need be incurred by such an addition to its inmates. Another great benefit might be fairly expected to follow; and that is by bringing the institution so much closer to the farming community of the Commonwealth, and interesting them in its success. The State Board has heretofore unanimously recommended and urged such a step, but it is in their power, through the legislature, to compel so wise a course, and in our judgment it would be competent to require from students so educated by the State, some guaranty that they would become practical agriculturists. We cordially recommend its trial. Perhaps some other changes may also be advantageous, both financially and practically.

DAIRYING.

It seems very important that some practical instruction should be given in the art of dairying, which is now entirely neglected, inasmuch as all the surplus milk is at once sold from the farm, affording the students little opportunity to learn its care or future treatment. The establishment of a butter and cheese factory might obviate this deficiency. This would not only permit and call for a large increase of stock on the farm, thus materially increasing home-made fertilizers, but would also open up a certain and steady market to the farmers of that section for this produce of their herds, and would probably induce a decided increase in the quantity of stock kept in the neighborhood. Such an establishment, if properly managed, ought to be more than self-supporting.

CULTIVATION OF SMALL FRUITS.

With a view of giving a more extended scope to the practical education of the young men, the majority of whom, it is hoped, intend to be Massachusetts farmers, it is recommended to greatly extend the cultivation of small fruits, and such other market crops as require a special culture, and are particularly suited to our climate. In Massachusetts, as all agree,

such branches of agriculture are becoming more and more important, and a faithful attention to these might be made to increase the resources of the farm.

AGRICULTURAL EXPERIMENTS.

It seems, also, that practical experiments might be constantly made with different fertilizers, crops and soils, and their results generally published in popular form in our newspapers and journals for the benefit of our whole farming community. Such experiments, if reliable, would be a source of great satisfaction to the farmer and often save him much disappointment and loss.

RAISING FOREST-TREES.

It is also recommended that some instruction be given in forestry, both theoretically and practically, and that special attention be paid to the raising of forest-trees from seed, their care and treatment in the nursery, their permanent planting in various portions of the farm, and the subsequent care of the plantations.

The time is not far distant when every farmer in the country will, in his own interest, be obliged to give some attention to the subject of tree-planting, and such a course as is here recommended will be of advantage to the students, and to the State at large. Similar considerations apply to the raising of fruit-trees.

A nursery of reliable standard fruit-trees, adapted to one section, ought to be a source of some income to the institution.

GARDEN SEEDS.

It seems, also, that the raising of pure and reliable seed for farm and garden crops might be added to the products of the farm, without materially increasing its expenses. When the Massachusetts Agricultural College has acquired the reputation of sending out the best and purest seed in the market, she will add to the many obligations which the farmers of Massachusetts ought to feel for her, and still more interest them in her welfare.

Another minor item of expense may perhaps be worthy of attention, whether the present rate of compensation to the

students for their labor on the farm, might not be reduced in accordance with the spirit of the times.

Your Committee are aware that this Board has no authority to introduce any changes in the instruction or management of the College, but that the sole control thereof is by law vested in the trustees; but understanding that the legislature, by making the Board of Agriculture overseers of the College, intended that they should in some way give expression to their views in regard to the institution, it seemed to them not out of place to introduce them in this report.

These suggestions are made by your Committee, not to criticise the present management of the institution, with which as a whole they are highly gratified, but because they feel interested in increasing and extending its influence.

It may not be practicable or wise to attempt to give it a preëminent position among the colleges of the country for a general literary or miscellaneous education, but it is practicable to make it, *par excellence*, *the* Agricultural College of the land.

With its splendid endowment, its large and noble farm, its healthful and admirable situation, its convenient and ample buildings, its admirable and salutary military discipline, its corps of accomplished, scientific and enthusiastic instructors, it ought to occupy a high position in the agricultural world; it ought to be "a burning and a shining light," attracting the attention and becoming the pride and admiration of every son of Massachusetts, throughout the land.

EDMUND H. BENNETT.
C. S. SARGENT.

BOSTON, February 1, 1876.

The Report was fully discussed, and finally accepted.

Mr. SESSIONS presented the following essay upon

DEVON CATTLE.

I have had an experience of over twenty-six years with this breed of cattle. I am not disposed to criticise other breeds, but will simply state some facts that have been collected in my own observation, and in an extensive correspondence with Devon breeders all over the country. Some of the facts here presented may come in place on this subject.

I would state that, when a boy, my father kept Shorthorn grades and natives, and that upon coming into possession of the farm, I looked about for something better adapted to our mountain farm, and the production of butter. I soon made up my mind that, all things considered, the Devons were the breed for our locality; that is, for a mountain farm, where the raising of stock for butter-cows and working-oxen was extensively followed, as well as the production of young cattle for grass-fed beef. Considering the three points of *milk*, *work* and *beef*, the *Devons* seemed to take the first place for the average New England farm.

Allow me to refer to a brief history of the Devon race in this country and in Europe.

HISTORY.

That the Devons are an ancient race of cattle, there can be no doubt. They bear all the characteristic marks of resemblance to the ancient races of the south of England and Wales; even the color, red, is traced in the Devon, Sussex, and Hereford. There is no race in England that can claim such undisputed antiquity.

The distinction between a "breed" and "race," Goodale defines as follows: "By breeds are understood such varieties as were originally produced by a cross or mixture, and subsequently established by selecting for breeding purposes only the best specimens, and rejecting all others. In process of time deviations become less frequent, and greater uniformity is secured, and this is in proportion to the time which elapses and the skill employed in selecting. Races are varieties moulded to their peculiar type by *natural* causes, with no interference of man, and no intermixture of other varieties; that have continued substantially the same, for a period beyond which the memory and knowledge of man does not reach." Such are the North Devon cattle.

There seems to have been three distinct races of these ancient cattle: the Long Horns, the Middle Horns, and Hornless or Polled Cattle. The Middle Horns represented the cattle of the region of Devonshire. Those races of cattle were bred by the ancient Celtic inhabitants, and constituted their chief subsistence. Youatt says: "The native inhabitants

were proud of their country, and prouder of their cattle, their choicest possession." "When their country was invaded by their enemies, they fled to the mountains for safety and protection, and took with them their cattle, upon which to subsist; and thus were preserved both themselves and their cattle; so that the races of cattle in these districts have been the same from time immemorial." In a few instances, the wild forest cattle have been kept distinct, in a wild state, to this day; as in the parks of Chillingham and Chartley; and are said to be similar to those that existed in the tenth century; and also bear a strong resemblance to the present domestic breeds of that region.

COLOR.

"It seems the people had a superstitious reverence attached to the red color (in Scotland and Wales) in the tradition of the country; the milk of the red cow was considered a remedy for every disease, and a preservative from every evil." The breeders of the improved Devons adhere scrupulously to the deep red color of the hair, and reject individuals that have a tendency to produce white. And it seems that in this way, if no other, the color of the Devons has been established and perpetuated. The deep red color of the pure-bred Devon is implanted so strongly, that there is no race in which an admixture of foreign blood is so easily traced; nor is there a race that has remained so free from foreign intermixture. Their color is generally stamped on the progeny, in a cross with any other breed; so much so, that when the Devon bull is crossed on the native and grade cows, of whatever color, the progeny are almost invariably red like the sire.

ENGLISH IMPROVED DEVONS.

The improvement of these ancient races of cattle, which has resulted in the present perfected breed, was commenced about one hundred and fifty years ago.

Mr. Shillabear, the agent for the present Earl of Leicester, states that it was towards the close of the last century, that the late Lord Leicester (who was a very good judge of stock) became a purchaser, not only of Devon steers for working, but also of the best males and females for breeding purposes, and, as is well known, he soon established a valuable herd.

John Tanner Davy, of Rose Ash, England, the editor of the English Devon Herd-book, inherited the herd of his father, who had carefully bred the Devons for fifty years. Mr. Francis Quartly, whose engraving adorns the first volume of Davy's Devon Herd-book, endeavored, by a long course of selection, and by an intimate knowledge of the principles of breeding, to combine the various elements in the different herds, so as to attain the great object of the Devon breeder, the lessening of the parts of the animal frame least useful to man, as the bone and offal, and at the same time, the increase of such other parts, as fat and flesh, that furnish food, and to do this at the earliest possible age, and with the least consumption of food. That Mr. Quartly succeeded in fully establishing these characteristics of the breed, we need no better evidence than that nine-tenths of the pedigrees of the present herds, in Davy's Herd-book, go directly back to the old Quartly stock; twenty-seven out of twenty-nine of the prize bulls mentioned in that work, are descendants from the bull Forester (46); and twenty-nine out of thirty-four prize cows mentioned there, descended from the cow Curly (92). Hundred Guinea (56), another noted ancestor of the Quartly tribe, stands in the pedigrees of this breed, as Hubback among the Shorthorns. Among others who have done much to improve their herds, and bring the breed to its present state of perfection, may be mentioned the Earl of Leicester, James Davy, Mr. Richard Merson, James and John Quartly, who also inherited the herds of their fathers, and continued their well-begun improvement. Mr. George Turner of Barton, whose herd was made up from other breeders, Mr. Samuel Farthing of Somerset, Mr. John Halse of Moland, Mr. Wm. Hole of Somerset, Mr. T. B. Morle of Cummington, Mr. George Shapland of Oakford, and Mr. John Ayre Thomas of Rose Ash, Devon, with many others, have caught the spirit of improvement, and continued to progress towards perfection.

We quote the following from the preface of John T. Davy's third volume of English Devon Herd-book:—

"Mr. R. Smith's Report on the Exhibition of Live-Stock at Chester, England, 'Royal Agricultural Journal,' Vol. IX., Part II. (Mr. Smith was a celebrated breeder of Shorthorns).

At page 370, he says: 'The Devons were justly designated the *élite* of the yard.' He further says: 'I conclude these remarks with the words of a Shorthorn friend who accompanied me through the Devon classes. He exclaimed, "I am delighted! I find we Shorthorn men have yet much to learn of the true formation of animals; their beautiful contour, and extreme quantity of flesh, surprise me."' Again Mr. Smith writes: 'As converters of vegetable into animal food—breed against breed—they are found to *return as much per acre, or for weight of food consumed*, as any other breed.' He might have added, and are well adapted to live in poor pastures, in exposed situations."

Mr. Bloomfield, the manager of the late Earl of Leicester's estate, at Holkham Hall, Norfolk, England, has, by careful attention, greatly improved the size and quality of the Devons, and increased their milking properties, so that he obtained a prize for having produced an average annual yield of two hundred pounds of butter per cow, in a dairy of twenty cows, or equal to four pounds per week the year round; and he offered to milk forty pure Devons from his own herd, against an equal number of cows in any one herd, of any breed found in England, without finding a competitor. At the Smithfield show of fat cattle, held at the London market-place, in 1858, the gold medal for the best ox or steer of any breed in the show-yard, was awarded to a Devon, bred and owned by the Earl of Leicester. They are highly esteemed in the Smithfield market, not only for the excellence of the meat, but because its size is more agreeable, on most tables, than the huge joints of some other breeds. In weight, they are much excelled, but the opinion of the Devon breeder is, that more meat can be made from them, with a given amount of food, than from any other breed. The quality of the Devon beef is unsurpassed, even rivalling the little black West Highland ox, in the estimation of the London west-end butcher, whose fastidious customers oblige him to kill none but beef of the finest quality and flavor. In the New York market, the "red oxen of Connecticut" most generally bring the highest price, they being Devon grades. The Devons have the preference of all other breeds for the yoke, being strong, active, and of great endurance; and are remarkable for docility and good temper.

The native cattle in many sections of New England resemble the Devons in many respects, and the fact that most of the early settlers were from the south of England, renders it quite probable that they selected their cattle from that region. The first account that we have of the importation of cattle into New England, was in the ship Charity, in the spring of 1623, in the care of Mr. Winslow, then agent of the colony of Plymouth. Their descendants show by their color that they were Devons, or Devon grades.

AMERICAN IMPROVED DEVONS.

The first importation of improved North Devons into this country was in 1817. Mr. Coke, afterwards Earl of Leicester, presented to Mr. Robert Patterson, of Baltimore, Maryland, six heifers and one bull, Taurus (320). Taurus was bred by Mr. Denny, a tenant of Mr. Coke, afterwards Earl of Leicester, who paid fifty guineas for him. His dam, in 1820, made thirteen pounds of butter per week. Three of these heifers Mr. Patterson gave to his father-in-law, Mr. Richard Caton; the other three he gave to his father, Mr. William Patterson; they were all bred to Taurus. In 1835, Mr. George Patterson came in possession of the herd of his father, Mr. William Patterson, and, in 1836, imported the bull Anchises (140), for a cross, from one of the best dairies in Devonshire. He afterward imported Eclipse (191); in 1846, Herod (214); and in 1852, Norfolk (266). By comparing the records, the fact is apparent, that the pedigree of Devon animals dates further back in this country than in England. Thus the bull Taurus (320) was calved in 1816, and imported in 1817, when a yearling, by Mr. Robert Patterson, of Maryland; Holkham (215), calved 1819; the cow Fancy (709) calved 1818, and Strawberry 1st (1,062), calved 1819; while the oldest record of English pedigrees is the bull Forester (46), calved in 1827, and Hundred Guineas (56), calved in 1837, the cows Flower (187), calved in 1820, Countess (77), in 1828, Curly (92), and Pretty Maid (364), were calved in 1830. Messrs. S. & L. Hurlburt, of Winchester, Conn., commenced their herd in 1819, from a pair procured of Mr. Patterson, Holkham (115), and Fancy (709), with additions from the same source every few years. In

1850, they imported Albert (2), whose progeny has stood high in the country, and received more premiums than the progeny of any other bull lately imported. Beauty (523), bred by Mr. Hurlburt, in 1836, from Fancy (709), and Exchange (197), produced sixteen pounds of butter per week in June, 1850, when she was fifteen years old. Mr. Coleman says, in his "European Agriculture," "The most productive cow in butter which I have found in England was a North Devon, which, for several weeks in succession, without extra feed, produced twenty-one pounds of butter per week. The character of the owner places the fact beyond a doubt."

Mr. L. F. Allen, of Black Rock, N. Y., commenced breeding in 1835, from stock obtained from the Hon. James L. King, of New York, whose father imported them about the year 1819, from the herd of the Earl of Leicester; in 1842, he added to his herd from Mr. Patterson's stock. In 1844, the Massachusetts Society for the Promotion of Agriculture imported four cows and one bull, Bloomfield (372), from the Earl of Leicester. They were boarded and bred for the society on the farm of Elias Phinney, of Lexington, till his death, the object being to present a pair to each of the county societies in the State. In 1848, Mr. C. S. Wainwright, of Rhinebeck, N. Y., commenced importing and breeding his herd. His first importation was the bull Megunticook (251), and the cows Nonpareil (924) and Helena (774). Helena gave as high as twenty-two quarts of milk per day, and made fifteen pounds of butter per week. In 1851, he imported May Boy (71), whose granddam, Old May Flower, made over seventeen pounds of butter per week. In 1853, Mr. George Vail, of Troy, N. Y., imported one bull and two heifers from the herds of Mr. Davy and the Earl of Leicester. In 1850 and 1852, Col. L. G. Morris, of New York, imported animals from the herds of the Earl of Leicester, the Messrs. Quartly, and John Ayer Thomas. Abijah Catlin, of Connecticut, imported, in 1851, Rubens (116), and two heifers. Many others have imported animals equally meritorious, among whom may be mentioned, Ambrose Stevens, of Batavia, N. Y., E. G. Faile, West Farms, N. Y., R. Linsley, West Meriden, Conn., R. W. Sanford, Orwell, Vt., E. P. Beck, Sheldon, N. Y., and R. H. Van Rensselaer, of Morris, N. Y. These

importations, with many others not mentioned, are sufficient to form the basis of a race of Devons in America not excelled by those in any other country.

As for their milk and butter qualities, we mention a few among the many examples we find on record, that have been famous for milk and butter, in addition to those already referred to above.

Mr. F. P. Holcomb, of New Castle, Del., made nineteen and a half pounds of butter per week from Lady. Hon. Horace Capron, Commissioner of Agriculture, formerly of Robin's Nest, Ill., made twenty-one pounds of butter in nine days from Flora 2d (120). C. P. Holcomb, of Delaware, in the summer of 1843, in twelve weeks, made from one cow one hundred seventy-four and three-quarters pounds of butter, or an average of fourteen pounds nine ounces per week; during one week she made nineteen pounds, and in three days nine and a half pounds. James Buckingham, of Duncan Falls, Ohio, in three months, in the summer of 1856, made from four cows an average of forty-four and a half pounds per week, besides using the cream and milk in a family of seven persons. L. G. Collins, of Newark, Mo., made from the dam of Red Jacket (98), sixteen and three-quarter pounds of butter per week.

Mr. Wm. Mattoon, of Springfield, has had great success in raising Devons, both for milk and beef. He slaughtered his bull, Springfield (342), whose dressed weight was one thousand one hundred and seventy-nine pounds, after hanging sixty hours; also his cow, Rose 6th (693), whose live weight in full feed was one thousand two hundred and fifteen pounds, and dressed weight nine hundred and eleven pounds, shrinking less than twenty-five per cent. His bull, Duke of Hampden (499), weighed, when sixteen months old, one thousand two hundred and ten pounds, having gained in the seventy-five days previous, two hundred and ten pounds, or two and four-fifth pounds per day. The feed given him was hay, shorts, and one quart of meal per day. At three years old he weighed two thousand and thirty pounds. His herd of cows, varying in age from four to seventeen years, weighed in the fall of 1874, on an average, one thousand two hundred thirty-three and three-fourths pounds each.

Mr. Ward Parker, of Merrimack, N. H., made from five Devon cows, in one year, $780, or an average of $156 per cow, in addition to the milk and butter used in the family. His cow Jessie (1052), made fifty pounds of butter in the month of February, 1874, or twelve and a half pounds per week, having calved January 18, 1874. In October, 1873, he tested the milk of his Devon cows with the lactometer, with the following result:—

Jessie (1052),	25	per cent.	cream.
Nelly Bly 5th (1168),	25	"	"
Rose 2d (1247),	24	"	"
Gem 4th,	24	"	"
Venus (1300),	27	"	"
Jessie Fremont (1057),	22	"	"

From five quarts of milk taken from Venus (1300), one pound of butter was made. The above-mentioned six cows yielded one pound of butter for every six quarts of milk.

The Devon cow Beauty, owned by Benjamin Blakeslee, of Thomaston, Conn., at the age of seven years, averaged eleven pounds of butter per week for four months, from January 1 to May 1, 1868.

Our system or plan of operations is, perhaps, different from most of those who keep stock for dairy purposes only. We have a grass, fruit and stock farm, and raise stock to sell. Our stock consumes what the farm produces, and we go abroad for none of the food for cattle. In keeping stock for breeding purposes, we have paid particular attention to the development of milk.

In the year 1873, we had ten cows giving milk, and two of those were milked by calves that were being raised on them, two on a cow. Not over eight cows were milked at any one time during the season for the production of butter. We made one thousand five hundred pounds of butter through the season, and sold it from the first of June to the first of October for forty cents per pound, and from forty-five to fifty cents per pound the rest of the year. Only three cows on the farm at that time were over three years old, and seven of the cows milked that year were with their first calf, two and

three year old heifers. Thirteen calves were raised last year, and nine this year.

The above may seem a small product for that number of cows, but when it is considered that they are all young, two and three year old heifers, it is a fair yield.

The importation of Devons of late into this country has been quite limited. This has resulted in consequence of the prohibition by the government of the importation of cattle, to prevent the spread of contagious diseases; and also from the fact that there is nothing to be gained by importing, except as a cross. The testimony of those who have visited the best herds in England, with the design of selecting animals with which to improve our own herds, has been, that "*we need not go abroad to obtain animals equal in every point of excellence to the best that can be found in England.*"

The late experience of the breeders of Devons, only confirms their former opinion of the excellent qualities of the breed, for the three grand objects for which all neat stock are kept, namely, *milk*, *work*, or *beef*, and of their adaptation to many sections of our country, in preference to any other breed; also, that they will produce as much milk, work or beef, from the food consumed, or on a given quantity of land, as any other breed; their milk yielding a large amount of the first quality of cheese and cream, and the cream yielding a large amount of superior butter. The only objection ever presented to the breed, is, "they are too small"; but we can keep more of them, and that on shorter pastures and coarser food. In short, as many pounds of beef, and of a superior quality, can be produced with the Devons, on a given amount of food, as with any other breed, though it will require more animals to accomplish it.

In the northern portion of our country, and in mountainous sections, and on the sterile soils of many farms, the Devons will always be in demand.

H. M. Sessions.

The report was accepted.

The following essay was then submitted upon

AGRICULTURE AS A LIFE WORK.

The opinions of mankind at large concerning agriculture, are exceedingly diverse and contradictory. Scarcely two men out of a score, taken from the various ranks and pursuits of life, will agree as to its value. Up to a certain point, indeed, there is no diversity of opinion. As a calling of absolute necessity, vitally fundamental to all other industries, and in itself the immediate means of support to a large proportion of the human race, its importance is self-evident, and cannot be ignored. But when we go higher, and drop the general good to consider the individual; when we ask what agriculture demands of *the man*, and what it has to give him, and seek to compare its aims and rewards with the aims and rewards of other vocations in life, we shall find any assertion of its higher claims met with all shades of incredulity, denial, and even ridicule. We who know agriculture as a life work, experimentally, having summered and wintered upon the farm, ought to be able to help to find out and to establish what is the just estimation in which our calling should be held.

In our busy, new country, with its boundless work waiting to be done, the popular type of man has always been the man of affairs, an active man in some sphere. There is scarcely room, with all our broad land, for men to live studious and contemplative lives. The age and the public demand results, and have not much respect for anything that is not tangible and positive.

The "merchant prince" has been a great favorite with the American public. A great merchant, a man of comprehensive plans and executive force, having in hand large schemes of profitable enterprise, and bringing them to successful issue, commands fortune, with all its seductive luxuries and positive power; and to many, especially to many an eager lad, this material success seems worth all that it costs—a life; and the cost is not one life alone. To the intense strain upon mind and body, the anxieties, the self-denials (denials too often of one's best self), the hardening and sharpening of the whole nature, bent to one set of faculties,—one line of acute

and aggrandizing thought,—must be superadded the sum total of the great number of lives, which, striving for this prize, this success, have failed, and in bitterness of spirit accept the humble positions and inadequate rewards of subordinates or menials. For the great prosperity is a shining possibility in commercial circles, to which few, very few attain.

Sometimes the popular idol is the "public man," the man who professes to devote his time and talents to "serving his country." Statesmanship, the art of government, indeed, to men of fine talents, and above any necessity for pecuniary gain, may open the way to noble study and a fruitful life. It is a just reproach to us that politicians, men who seek only self-aggrandizement, have so prostituted great opportunities to vile ends, that men of purity and honor shrink from the inevitable contact which public life imposes.

The so-called learned professions have a time-honored claim upon our ambitious youth. They have such fine opportunities of work. A trained intellect, armed at all points by knowledge, and well fitted for warrare, may vindicate justice, and see equity done between man and man. Research and sagacity may do their utmost to relieve and preserve poor humanity; higher still, the gifted and sympathetic nature may spend and be spent in those works and words of tender helpfulness which have the power that no theology can take away. All these—the merchant, statesman, lawyer, doctor, priest—have their work and their wages, sufficient food for enthusiasm, and obstacles enough to call out all their strength. Can less be said of agriculture?

In the hurry and excitement of the cities, men are exceedingly liable to underrate the importance of agriculture to the national prosperity. If farming does not "pay," then nothing ought to pay. If any man has an indisputable right to a fair share of the good things of life, it is he who devotes himself to the production of those necessaries which are to support human existence, both on the farm itself and also wherever men are gathered together for other pursuits. But we must keep in mind the just and exact relations of cause and effect, and look for no returns disproportionate to our

expenditures. If a man labors with his muscles alone, he must not expect the earnings of trained intellectual faculties. In the scale of varying labors and rewards, every man will be paid according to the use he makes of those gifts and powers with which he is endowed. If he has a clear judgment and a sagacity that detects the subtle indications of supply and demand, so as to forestall the fluctuations of the markets; if he has a keen eye for animal anatomy and economy, and a quick insight into the laws of breeding, all these several capacities and talents will bring their legitimate return, if employed on the farm. Since agriculture *must* be the basis of all other prosperity, no success in any country is safe, if agriculture is not itself prosperous. Perhaps no calling is so *broad*, has room for so many varieties of men, as agriculture; not only in the obvious sense of furnishing work in unlimited quantity, but also in its capability of furnishing every quality of work. Our demand for unskilled labor absorbs countless thousands of the workers of other lands. We have room for them; we have also room for every grade of work, from low to high, from mere muscular toil to the original investigations of science.

But we must frankly admit, that the actual life of the average farmer—even of the average New England farmer—is far from being the highest or noblest. Let us see it in its true colors, denying none of its asperities. There is certainly very much in it that is coarse, harsh and sordid. Who does not recognize the constant *grind* which yet keeps a man poor all his life; the perpetual and degrading round of drudgery to which so many farmers tie down their lives? What is the range of thought of the average farmer? What is the lot in life, the sources of pleasure and improvement, which fall to his wife? What chances does he put before his sons and daughters?

To many, this will call up a dark picture; but admitting its blackest features, the question arises, *Is the fault in the men in the calling?* Do not the most intelligent, the most enterprising and thoroughly educated farmers, bring their farming up to their own level? Do not higher ambitions suggest higher possibilities in their work?

Agriculture is capable of infinite development. Both brains and money can be freely spent on these rugged and most beautiful hills and valleys of Massachusetts, and they will bring returns which shall abundantly reward our confidence in nature. Who that loves his native land is willing to see these farms falling into decay, impoverished and abandoned in some instances; in others, becoming the heritage of the stout children of emigrant parents, whose sturdy muscles and undeveloped minds make little demand of the soil, save as healthy animals, and whose savings are accumulated by the lack of all the higher wants? Yet this seems to be the inevitable tendency of the disposition which seeks to degrade farming, and by the cheerless and dispiriting aspect in which it exhibits itself to the young, to repel them and drive them from the farm.

If the future of agriculture in New England is to be a bright one; if farmers are to reap better returns for their labors, while constantly increasing the productive capacity of the soil—,and this is what we demand, if agriculture is to keep up with the progress of the age,—it must be by raising the standard of *man* on the farm.

This, chiefly, must exalt agriculture. With a body of men earnestly engaged in farming, of high culture and public spirit,—men trained to exact observation and intelligent comparison of data,—we may hope to reach a solution of some of the vexed questions which now retard the progress of scientific farming. To men of this class, financial success, as leading one of the great industries of life, should surely be open, as well as the delights and immunities of rural life. What those attractions and rewards are, we who enjoy them best know, and surely they are not to be underrated. There is a mysterious sympathy inherent in mankind which draws men to the soil. From Adam down, the tillers of the soil have ever found their toil good.

What can a man learn of nature? In her processes we see the inexorable power of law, the mystery of life. In her varying aspects we find solace, encouragement, inspiration, rest. In working with her we join our thread to the web of fate, and God himself keeps the shuttle flying. If any man would see his work prosper in his hands, shall he not guide it

by those immutable laws of seed-time and harvest, the dial of heaven itself, and if he fails at this noble work, his machinery must be regulated till the results are right.

HENRY S. GOODALE.

The essay was read and accepted, when the Board adjourned.

SECOND DAY.

The Board met at ten o'clock A. M. Hon. MARSHALL P. WILDER in the chair.

Present: Messrs. Baker, Bennett, Davis, Dwight, Fenn, Goessmann, Hadwen, Hawes, Holland, Knowlton, Knox, Ladd, Loring, Macy, Moore, Perry, Phinney, Saltonstall, Sanderson, Shepley, Metcalf J. Smith, Milo J. Smith, Vincent, Wakefield, L. P. Warner, W. L. Warner and Wilder.

Col. STONE, Committee on Credentials, submitted the following

REPORT:

The Committee on Credentials respectfully report that the credentials of new members have been examined, and the following delegates are duly elected:—By the

Middlesex,	JOHN B. MOORE.
Marshfield,	GEORGE M. BAKER.
Hampshire, Franklin & Hampden,	MILO J. SMITH.
Berkshire,	JOHN E. MERRILL.
Hampden East,	H. P. WAKEFIELD.
Nantucket,	ALEXANDER MACY, Jr.
Hampden,	J. N. BAGG.
Housatonic,	DANIEL B. FENN.
Bristol Central,	JOHN A. HAWES,
Worcester South-East,	WILLIAM KNOWLTON.
Hingham,	SOLOMON LINCOLN.
Appointed by the Executive,	PAUL A. CHADBOURNE.

(Signed) ELIPHALET STONE,
Committee.

The report was accepted.

The Reports of Delegates being in order, Judge Bennett reported upon the Norfolk Society; Dr. Wakefield upon the

Bristol; Mr. W. L. Warner upon the Martha's Vineyard; Mr. Metcalf J. Smith upon the Middlesex South; Mr. Ladd upon the Worcester South; Mr. Hadwen upon the Housatonic; Mr. Baker upon the Hampshire; Mr. Sanderson upon the Essex; Mr. Davis upon the Middlesex North, and Mr. Chadbourne (read by the Secretary) upon the Worcester North.

Committees were announced by the chair, as follows:—

1. *On the Assignment of Delegates.*—Messrs. W. L. Warner, Stone and Vincent.

2. *On the Assignment of Subjects for Essays.*—Messrs. Davis, Sargent and Shepley.

3. *On the Time and Place of Holding the Country Meeting.*—Messrs. Moore, Hawes and Hadwen.

4. *On the Nomination of the Examining Committee of the Massachusetts Agricultural College.*—Messrs. Phinney, Saltonstall and Bennett.

On motion of Capt. Moore, it was—

Voted, That the country meeting be held on the 14th, 15th and 16th of November.

Col. Wilder then submitted the following essay upon the

METHODS FOR THE IMPROVEMENT OF FRUITS.

In conformity to the duty assigned, your Committee submit the following suggestions as pertinent to the inquiry, What methods can be adopted to secure improved varieties of fruits?

The great loss sustained in the importation and trial of trees from foreign shores, and even from different quarters of our own country, which are not adapted to our own location, suggests the answer, *That new varieties must be produced from seed, and be to the manor born, to remedy this evil.*

The adaptation of plants to various climates, and their distribution over thee arth, involve a study so profound, that few have any definite knowledge on the subject. Why some are suited, by their constitution, to a wide extent of territory, and

are able to adapt themselves to almost any altitude or latitude or temperature without material change, while others are confined to a narrow limit, and will not prosper elsewhere; or why a fruit may succeed in one location, and a few miles distant fail entirely, are mysteries which mankind has not yet been able to solve. The human constitution will frequently endure the change of country and climate, but the extent to which plants can bear these changes is fixed by an immutable law; therefore, all attempts to acclimate such as are not naturally congenial will fail in the end, except it be within very narrow limits,—not, however, that a tree or plant may not sometimes endure greater degrees of cold or heat than it is subject to in its native climate; but no one should suppose that time will produce a physiological or constitutional change in them.

It is, however, sufficient for us to know, that we can produce from seed, fruits, which, by their constitution and habits, are capable of enduring the cold and heat, the drought and moisture, and other vicissitudes of the region we inhabit; but the idea that we can accustom a tree or plant to conditions not consistent with its laws of being, is a chimera of the imagination. The only acclimation that we can rely on for obtaining trees and plants of stronger constitution is the production of new varieties from seed hybridized by the hand of man, or naturally cross-fertilized by insects or the air. Whatever opinions may have been entertained, to this we must come at last: that, for the acquisition of hardy, valuable fruits, adapted to our various locations, *we must depend mainly on the production from seed.*

These are the only means placed in our hands by Providence, and on these we must ever depend, if we except proper location and treatment, for the improvement of our fruits.

Much has already been accomplished by the production of new varieties of American fruits from seed; but how little, compared with the results obtained in other lands by the art of hybridization in the vegetable kingdom. To this art we are mainly indebted for the numerous fine varieties of grains, vegetables and flowers introduced in our own time, and the same success will reward similar efforts to produce new and valuable fruits suited to our own clime. Says Prof. Gray,

in his admirable essay before the American Pomological Society, "Most of our esteemed and important fruits have not so much been given to man, as made by him; and man's work in this respect is mainly to direct the course, or tendency, of nature." The success which has attended the American cultivator in the production of new and fine varieties of fruits, vegetables and plants, which rival the choicest varieties of the Old World, is indeed remarkable, and it will be far greater when the same scientific knowledge is applied to the production of native fruits.

The laws which govern the procreation of species by cross-impregnation are now so well understood by those who have scientific knowledge, as to leave no doubt of success. Thus, the fruitist, the farmer and the florist, are producing results which, as to form, habit, color, proportion and beauty, surprise the operator himself, when he sees how kindly nature coöperates with his efforts to bring forth the object of his desires. There may be disappointments,—these are the lot of humanity,—but the philosophical principle is correct, and the results of practice are now universally acknowledged; and although the improvement sought for may not be realized in every instance, experience has taught us that it will come at last.

When we look back to the original types of many of our fruits,—small, inferior, hard, and of acrid, disagreeable flavor, —and compare them with our large, magnificent apples, melting pears, luscious peaches, delicious grapes and strawberries, we realize the improvement which has already taken place. It is not unreasonable to suppose that there are rich stores still reserved in the arcana of nature which may be developed by the hand of man. We may not produce more beautiful apples or luscious pears than we now possess, but we may gain numerous new kinds, of equal value, and better adapted to our various locations, seasons and markets, and we believe the time is not distant when we shall produce varieties equally well adapted to extensive location, as the Bartlett and *Beurre d'Anjou* pear, the Concord grape and the Wilson strawberry, and of much better quality than the last named.

Your Committee would therefore encourage our cultivators in the belief that, by the sowing of the seeds of our best

varieties, and by cross-impregnation, there is a wide field open for improvement, and that all attempts at acclimation are fruitless. Nor would we discourage the planting and proving of the new varieties from other regions, holding fast such as are suited; and where they do not succeed in one location, it is possible they may be adapted to another. This is especially true with regard to the varieties of the strawberry. While one cultivator cannot grow the President Wilder, another declares he will grow no other; and thus with the Hovey's Seedling, which, after forty-two years of existence, has this year carried off the highest prize offered by the Massachusetts Horticultural Society for the strawberry.

MARSHALL P. WILDER.
JOHN B. MOORE.
O. B. HADWEN.

The essay was accepted.

After some discussion upon the Agricultural College, during which Judge BENNETT suggested that the Examining Committee be enlarged to five members, on motion of Mr. SALTONSTALL, it was—

Voted, That the Committee of Visitation to the Agricultural College be a Standing Committee, to consist of five, of whom the first two on the list shall, at the end of each year, retire, their places to be filled by two new members, who shall be added to the end of the list, by which method the Chairman will always have three years' service.

The Committee on Examination was constituted by the appointment of Messrs. Bennett, Sargent, Hadwen, Moore and Chadbourne.

Voted, To appoint a committee of three to suggest what action should be taken with reference to the death of Hon. ALBERT FEARING. Messrs. Saltonstall, Knowlton and Baker.

The committee subsequently reported the following resolutions:—

Resolved, That in the death of Hon. ALBERT FEARING this Board has sustained a great loss. Mr. Fearing, in his inter-

course with the Board, always evinced such gentle, Christian courtesy and marked zeal in advancing the agricultural interests of the Commonwealth, that his place cannot easily be filled. His character was, in all ways, so beautiful, his generosity so abounding, his charities conducted with such modesty, the simplicity and loveliness of his nature were so attractive, that the hearts of all men, in every walk in life, who have known this excellent man, are filled with grief at their bereavement.

Resolved, That a copy of this resolution be communicated to the family of the deceased.

The resolutions were adopted unanimously by a rising vote.

Prof. GOESSMANN then submitted and read the

SECOND REPORT ON THE SALT MARSHES ABOVE THE MOUTH OF GREEN HARBOR RIVER, IN THE TOWNSHIP OF MARSHFIELD, PLYMOUTH COUNTY, MASSACHUSETTS.

In a previous report I stated the origin, the general character and the agricultural history of a few successfully reclaimed sea marshes of Europe, for the purpose of rendering more prominent some striking features of similarity which exist between them and the recently diked marshes above the mouth of the Green Harbor River in the township of Marshfield, Plymouth County, Massachusetts. I attempted, also, to show somewhat in detail the gradual changes which the original spontaneous vegetation was undergoing since the water of the ocean has been excluded, in consequence of the construction of an efficient dike, pointing out on the same occasion some of the causes which seemed to control the still varying or broken-up aspect of the present natural growth in the different sections of the salt marshes.

Several analyses of soil, taken from different portions of the latter, served to demonstrate quite conclusively that a lack of any essential article of soil plant-food, in the present stage of the salt meadows, could not be considered the real cause of the unusual differences quite frequently noticeable in the character and the value of plants growing in close

proximity to each other: for instance, a patch of samphire (*Salicornia herbacea*) in the midst of a luxuriant spontaneous growth of valuable fresh-meadow grasses. This unsatisfactory condition was assumed to be due to a still inefficient mode of drainage, aggravated here and there by locally confined impervious layers of a clayish nature within the succeeding stratifications of the soil. Knowing from personal observation elsewhere that the fitness, even of the best of soils once thoroughly impregnated with salt water, for a successful cultivation of most farm crops, would largely depend on the degree of drainage which that soil chanced to enjoy after the excess of the salt water had been prevented, I have continued to inquire, for two succeeding seasons, by means of chemical analyses, into the degree of the changes which the subsoil water undergoes in consequence of a gradual replacement of the saline oceanic water by the fresh water of the creek, which flows through the marshes.

As intervening impervious strata of soil would quite naturally retard for years the removal of the accumulated saline matter of the surface-soil by means of atmospheric precipitations of moisture, it became of the utmost importance to ascertain the peculiar character of the various successive layers of soil, which exist within the different parts of the marsh lands, as far as their quality and their extent are concerned. The chances of getting some more definite information regarding these points have been somewhat improved during the past years, in consequence of a more extensive and thorough construction of drain ditches within the central part of the marsh lands.

Within the few succeeding pages, I propose to report my analytical results, and to discuss shortly: first, the *late changes* in the composition of the subsoil water, as compared with the previous years; second, the quality of the soil in the central portion of the marshes, with regard to its chemical and physical conditions; third, the general character of the natural vegetation upon the reclaimed lands during the past year, in connection with the results of experiments carried on during the same period.

Various analytical examinations of the subsoil water, taken from the centre of the marshes during the summer of 1874,

proved that its general saline character had changed but little as compared with that of the ocean; whilst in some instances, on account of a state of stagnation, the chlorides of the water of the ocean had been increased by nearly one-third in quantity.

Results of Analyses in 1874.

Water of the Atlantic Ocean contain	1.9407 per cent. of chlorine.—*Kerl.*
Subsoil water from the central portion of the marshes contained . . .	1.702 per cent. of chlorine.
Subsoil water from the lower marshes, showing strong indications of local stagnation and evaporation, contained	2.3195 per cent. of chlorine.

Results of Analyses in 1875.

Water from a large ditch, four feet deep in the central part of the marshes, contained	0.8282 per cent. of chlorine.
	0.1016 " of sulphuric acid.
Water from a ditch three feet deep, and about one hundred rods distant from the previously-mentioned locality, contained	0.1386 per cent. of chlorine.
	0.0934 " of sulphuric acid.

The first-mentioned sample of water of 1875—being collected from a depth which corresponded with the temporary level of the subsoil water—represents quite likely the general degree of alteration which the original soil water has suffered under favorable conditions, in consequence of the excess of the fresh water from the creek, as far as that particular central section of the marsh is concerned. The water consisted of three-fifths of fresh water and two-fifths of genuine salt water; both the absolute and relative amount of chlorine and sulphuric acid found, point in that direction. G. Forchhammer, who has made the composition of the water of the Atlantic Ocean a special subject of investigation, considers 100 parts of chlorine to 11.89 parts of sulphuric acid the mean relative proportion of these substances in that liquid.

The second sample of water tested, 1875, which was taken from a level one foot higher than the first one, represents evidently a kind of soil water which will quite frequently

result from the mere washing of that portion of soil, which is more or less permanently above the usual level of the subsoil water of the marshes. The low percentage of chlorine, and the relatively high percentage of sulphuric acid, indicate quite plainly that a resolution of previously separated saline constituents of the ocean,—containing for obvious reasons a higher percentage of sulphate of lime,—could only have caused its peculiar composition. These analytical results are quite encouraging; for they prove, that in some localities at least, a decidedly favorable change has been going on regarding the composition of the subsoil water, and also that the level of the latter has been actually and permanently lowered.

Stagnant water prevents a rapid disintegration of mineral and vegetable matter, by excluding the air; salt water increases that effect, particularly as far as the latter is concerned. The beneficial influences of the freshening of the soil water, and the permanent lowering of the water level within the marshes, showed themselves during the past year in two conspicuous ways; namely, first in a frequent change of the color of the soil, wherever it had been brought above the former general level of the water, and thereby under the unrestricted influence of air and light. Second, in a more rapid decomposition of the accumulated vegetable matter, which underlaid the present sod, and had served as its immediate support.

The frequent disappearance of grasses—as the native "goose grass" and the seeded-down redtop and timothy—from localities where they had prospered during the preceding year, could be almost invariably traced to an exposure of their roots in consequence of the decomposition of the vegetable matter of preceding periods of vegetation, which previously protected them against the extremes of the season. The severe winter of 1874–75, and the drought during the spring of 1875, had both favored their early extinction. A luxuriant spontaneous growth of annual upland plants, particularly of *everlasting* (*Gnaphalium polycephalum*, Mich.), was gradually taking their place.

The change in the color of the soil was quite noticeable everywhere along the recently exposed portion of the banks of the creek; it became, however, very conspicuous within

several ditches in the central section of the marshes, near the locality where my samples of subsoil water had been collected.

These ditches had been dug quite recently upon the property of Mr. Williams, of Boston, for improved drainage. They consisted of several parallel sections, and amounted to from four hundred and sixty to four hundred and seventy rods in total length; they were from three to five feet deep.

The soil, when first removed, was more or less of a uniform bluish-gray color; after being exposed to the influence of the air, it turned usually more yellowish; in some places it became red. This change was mainly due to an oxidation of the protoxide of iron into sesquioxide. As the protoxide of iron is known to be injurious to plant-life, good airing of the soil in the marshes, by draining and subsequent ploughing, becomes indispensable for its successful cultivation in the interest of a general system of mixed farming.

The side-walls of the ditches furnished an excellent chance to ascertain the peculiar character of the various layers which constitute the soil within the central position of the marshes.

The opinion expressed in my first report,—that the marsh-lands would prove to be formed by numerous layers of mineral matter, varying quite frequently, even within a comparatively confined area, widely in regard to the relative proportion of the essential constituents,—was fully confirmed.

A vertical section of the soil, to a depth of five feet, showed also more or less extensive accumulations of vegetable matter, resulting from different successive levels of growth, which formed distinct layers, separated, not infrequently, by quite different kinds of soil.

The latter showed, in many instances, local accumulations of sesquioxide of iron, which rendered the color of the soil, within a limited area, bright red. The entire bulk of soil as removed from the ditches, if properly mixed, deserved in most instances to be called a good sandy ferruginous loam, which, in its present state, is unusually rich in organic matter.

In other localities, for instance, upon some of the cultivated islands in the creek, the soil is of a black-brown color, and of a fine pulverulent texture.

The color in the latter case is mainly due to half-decomposed or humified organic matter. The various strata of soil

differ also here and there in regard to the relative proportion of sand, and of clayish silt. The admixture of sand renders the clayish silt permeable, and thus fit for successful drainage. The degree of fitness in that respect depends on the relative proportion in which they constitute the soil. There are evidently unusual differences in regard to that point; for whilst the soil in some cases, in consequence of the size and the quantity of the sand, proves to be very favorable for drainage, in other instances, on account of opposite conditions, it becomes very impervious to water.

The existence of a layer of that kind in close proximity to the surface-growth, particularly in case the locality is somewhat depressed as compared with the surrounding level of the soil, and thereby favors the accumulation of the drainage waters of the surface-layers in its vicinity, causes, quite frequently, barren spots in the midst of a healthy new vegetation.

The rain water, after having abstracted more or less of the residual saline matter of the salt water which formerly overflowed the marshes, collects usually in more or less large quantities in these depressions, where it may evaporate at any time during the season in consequence of an inefficient drainage, leaving the saline constituents behind. Although these washings of the surface-soil in their diluted state may not affect the new growth in the early spring, they will surely prove highly injurious to most of our farm plants as soon as they reach a high degree of concentration by evaporation.

Localities which suffer from these influences are quite frequently covered during the first part of the season with a new, valuable vegetation, similar to that of the surrounding lands; yet become barren as soon as the natural rate of evaporation of water exceeds the access of the latter by atmospheric precipitations.

These spots appear, in the latter part of the season, as if the torch had passed over them, for nothing but a few genuine salt-plants are usually left.

As the final result in these cases is quite naturally a matter of degree, every stage of injurious reaction may be noticed. A close examination of the dry surface mass within these depressions revealed the presence of common salt, with some

of its essential associated constituents in the ocean, besides an unusually large percentage of phosphoric acid. The latter appeared to be present mainly as a phosphate of proto-sesquioxide of iron.

A few subsequent analytical statements may convey some definite idea regarding that surface mass, which in most instances is of bluish-green color, and only here and there yellowish red, in consequence of a large excess of hydrated sesquioxide of iron; it appeared usually in form of scales separated from the underlying mass.

I. One hundred parts of the air-dry mass lost, at 100°–110 C., . .	10 per cent. of moisture.
One hundred parts of the same sample, left by calcination, . .	39.5 parts of ash constituents.
One hundred parts of the air-dry mass contained	0.5630 per cent. of phosphoric acid.
II. One hundred parts of an air-dry sample, taken from a different locality, contained . . .	0.8510 per cent. of sulphuric acid.

The quantity of phosphoric acid noticed in these two instances is very large, and exceeds in the second case—in percentage, twice the amount of that acid—found in the ash constituents of the entire organic and inorganic soil mass of the central portion of the marshes (see Secretary's report for 1874, page 339).

As the main portion of the phosphoric acid had been left behind by the evaporation of the surface-soil water, it becomes quite evident, that the latter is unusually rich in one of the most valuable soil constituents; but we are told, also, in an unmistakable manner, how essential it is for future agricultural success, as far as time is concerned, that the drainage of the marshes should be attended to without delay, and, at the same time, with a view to a system which would bring the discharge of the drainage water as far as practicable under a satisfactory control.

It is a well-known fact, that both carbonic acid and chloride of sodium (common salt) favor in a remarkable degree—accompanied with water—the solubility of neutral phosphate of lime. One per cent. of salt secures its full reaction. The

amount of phosphoric acid found, as above stated, is the result of their united influence.

The combination of phosphoric acid with the oxide of iron, the form in which I observed it, is due to a secondary reaction: namely, that of soluble iron compounds on soluble phosphates. This process is highly favored by the reducing action of the decaying vegetable matter on the sesquioxide of iron within the soil, as well as by the continual production of carbonic acid from the same source.

The latter renders the phosphate of protoxide of iron soluble, and thereby promotes its successful diffusion throughout that body of the soil which is permeated by the soil water. As the conditions for the solution of insoluble phosphates, as phosphate of lime, are favored in an unusual degree by the presence of salt, it becomes a matter of economy to check the reaction of the saline water on the natural resources of the soil as long as the excess of decaying vegetable matter can furnish carbonic acid enough to render an efficient amount of that plant-food available.

To leave the marsh lands, therefore, for any length of time under the unrestricted influence of both agencies for the distribution of the ready plant-food, is, from an agricultural stand-point, to say the least, a bad economy. The loss of their natural soil resources will increase in magnitude in the same degree as the present accumulated vegetable matter will be permitted to waste away without securing its soluble essential plant constituents by getting control of the drainage.

The close relation which evidently exists between the soil in the marshes and the beach-sand on their eastern outskirts, rendered it very desirable that some more definite information regarding its chemical character should be secured.

My analytical inquiries are not far enough advanced to present here exact quantitative results, yet they are already sufficiently decisive to assert that the sand—being apparently in its main bulk of granitic origin, consisting, therefore, of a series of valuable mineral species, and not merely of fragments of quartz—must be regarded, on account of its chemical qualities, as far as it has entered by natural causes the soil of the marshes, as a very valuable constituent; and for the same

reason, may serve advantageously in many instances for the amelioration of its turfy sections.

An abstract of the sand with diluted nitric acid gave quite strong indications of the presence of available lime, magnesia and phosphoric acid. I hope to be able, on some future occasion, to present more definite figures.

Having attempted, within the previous pages, to describe shortly some of the important physical and chemical changes which the marshes are at present undergoing, it remains for me to report briefly the late history of the reclaimed lands, with particular reference to the character of the present natural vegetation, and the results of some agricultural improvements and experiments carried on during the past season. For many of the subsequent statements I feel under particular obligation to George M. Baker, Esq., member of this Board from the Marshfield Agricultural Society, whose kind assistance and liberal hospitality I have always enjoyed during my visits to the marshes.

The dike has done its business well during the past season; considerable work has been carried on in regard to strengthening, raising and sodding it.

The water of the creek has always been kept from four to six feet below the surface. The past year has been unfavorable to improved crops; the severity of the winter of 1874 killed some of the English grasses that had promised well during the previous season; and the drought of the late spring affected seriously the grasses which had been seeded down during the preceding autumn, as well as those which grew spontaneously during the spring. Some two hundred acres of grass were sown last autumn, and many acres during the spring.

The season was late and cold in its earlier stage, and turned into a drought soon after, which lasted until the second week in June.

The salt grasses had almost entirely disappeared, and the more valuable "goose grass" (*Glyceria maritima*) had made its appearance more generally in many localities.

Although less vigorous than in the previous season, many acres gave promise of good crops. The lateness of the season delayed the harvesting, and only a few acres were saved from

utter destruction by countless numbers of grasshoppers, which made their appearance during the latter part of June.

Wherever the salt grasses had disappeared, in consequence of the removal of the salt water, and a subsequent rapid decay had destroyed the compact vegetable matter which served as immediate support of the sod, an unusually vigorous crop of "everlasting" sprung up spontaneously. But in spite of many adverse circumstances, tons of good English hay were secured as the results of previous seeding.

Vegetables of various kinds were planted along the banks of the creek, and upon some islands in the latter; they promised an abundant yield before the grasshoppers disposed of them. A few squash-vines, that escaped an entire destruction, produced half a ton or more of fine specimens. The vigorous character of the plants which here and there were saved from the greediness of the invaders, showed conclusively the high fertility of the soil, and that good crops will be secured as soon as the ordinary conditions are complied with, and the general circumstances are favorable.

A series of experiments with special fertilizers, at my direction, kindly instituted by Dr. Henry, of Marshfield, failed also on account of the grasshoppers. Unlike the experience of the previous year, the grass-seed did better when the ground was harrowed, instead of being simply scattered over the existing sod. Successful attempts at ploughing have also been made in various parts of the marshes. One acre on the south side of the creek was ploughed by Mr. White, and seeded down with oats, which looked remarkably well; he also ploughed and harrowed about one acre upon an island in the creek, near the middle of the marshes. The soil was of a dark color, very mellow and deep; evidently very valuable for the cultivation of garden crops. Upon that soil were raised the squashes above mentioned. The ploughed sod remained in a few instances too dry and tough to permit at once a successful cultivation.

During the last autumn, about forty acres of marshes have been ploughed. Some have been sown to grain and grass; but the larger part has been harrowed and prepared for seeding in the spring.

These trials of a systematic cultivation are still mainly con-

fined to the central part of the marshes, near the creek where the drainage is most advanced.

Some ditches, from three to five feet deep, and in all four hundred and sixty-four feet long, have been dug during the earlier part of the season for the drainage of the "Parsonage Meadow," which is situated in the centre of the marshes, and had suffered much from want of drainage. The ditches are running several rods apart, and are connected by shallow cross-drains made by a drain-plough. Also a barn, one hundred feet by eighty, has been built upon "Fox Island," a natural elevation in the marsh meadows; it belongs to the same party who has inaugurated a more efficient system of drainage. The number of the proprietors of the marshes has been reduced to about one-third (52) of that of the original owners; they propose to organize under the law of general fields, and an application for that purpose to the superior court has already been made.

After considering carefully the nature and extent of the physical and chemical changes which of late are going on in the marshes, in connection with the present character and condition of the natural vegetation, as well as actual experimental results of the past season, I feel as if nothing need be added for the present to my last year's recommendation regarding the best mode of a successful cultivation of the reclaimed lands; namely, one well-devised general plan for the drainage of the entire area of the marshes, and an effectual use of the plough wherever the present sod becomes too spongy and disconnected to protect a healthy crop of good fresh-meadow grass against the extremes of the season.

The question of manuring remains of secondary importance as long as large quantities of vegetable matter are still undecomposed in the soil, and the system of drainage remains in the present deficient condition.

Ch. A. Goessmann.
S. B. Phinney.

The report was accepted.

Dr. Wakefield, for the committee appointed to consider and report upon the days for beginning the fairs of the several societies, submitted the following report:—

The committee appointed by the Board of Agriculture at the last annual meeting, for the purpose of revising the times of holding the "fairs" of all the societies, have attended to the duty assigned them, and report, that the time of reckoning for each meeting shall be from the first Monday of September, so that the meeting of each society shall stand relatively the same from year to year, as follows: Bristol Central, the second Wednesday after the first Monday of September.

Bristol Central,	2d Wednesday.
Highland,	2d Thursday.
Worcester South,	2d Thursday.
Middlesex South,	3d Tuesday.
Hoosac Valley,	3d Tuesday.
Barnstable,	3d Tuesday.
Plymouth,	3d Wednesday.
Union,	3d Wednesday.
Worcester,	3d Thursday.
Hampden East,	3d Thursday.
Deerfield Valley,	3d Thursday.
Essex,	4th Tuesday.
Middlesex,	4th Thursday.
Hampshire,	4th Tuesday.
Bristol,	4th Tuesday.
Worcester North,	4th Tuesday.
Worcester South-East,	4th Tuesday.
Middlesex North,	4th Tuesday.
Housatonic,	4th Wednesday.
Hingham,	4th Wednesday.
Nantucket,	1st Wednesday.
Worcester West,	4th Thursday.
Norfolk,	4th Thursday.
Franklin,	4th Thursday.
Martha's Vineyard,	5th Tuesday.
Hampden,	5th Tuesday.
Berkshire,	5th Tuesday.
Worcester North-West,	5th Tuesday.
Marshfield,	5th Wednesday.
Hampshire, Franklin & Hampden,	5th Wednesday.

HORACE P. WAKEFIELD,
Committee.

BOSTON, February 2, 1876.

The report was accepted and adopted.

Prof. SARGENT then submitted a report upon

A FEW SUGGESTIONS ON TREE-PLANTING IN MASSACHUSETTS.

BY C. S. SARGENT,

Director of the Botanic Garden and Arboretum of Harvard University.

Every year the destruction of the American forests threatens us with new dangers. Every year renders it more imperative to provide some measures to check the evils which our predecessors in their ignorance have left us as a legacy with which to begin the second century of the Republic.

It may not, then, be entirely without interest to examine briefly what the dangers are which follow the destruction of the forests, and the methods of counteracting them, which, so far as Massachusetts is concerned, are fully within our reach.

Our agricultural population is not easily convinced of the necessity of tree-planting. The benefits are too vague, the profits too prospective, to cause them to look with enthusiasm on what seems a doubtful undertaking.

Still, in this respect, public opinion is gradually changing, and already in many of the States of the Union experiments in sylviculture are being made on a sufficient scale to promise the most gratifying results, and it is not improbable that at no distant day, when its benefits are more clearly understood, this branch of agriculture will receive at the hands of our farmers the attention its importance demands.

Proof is wanting that the total average rainfall has been reduced either in this country or Europe by cutting off the forests. But examples are often cited in proof that forests play an important part in regulating and attracting summer rains and local showers; and it is not improbable, were more data in the form of carefully conducted observations available, that some theory on this subject might be deduced. Certainly, as Mr. Marsh remarks in his admirable book on physical geography,* "it is impossible to suppose that a dense cloud, a sea of vapor, can pass over miles of surface, bristling with good

* The Earth as modified by Human Action. George P. Marsh. New York, 1874.

conductors, without undergoing and producing some change of electrical condition."

The following interesting illustrations are not without value as vaguely indicating in what direction we must turn for an explanation of the summer droughts, which in certain portions of the country have increased of late to an alarming extent. In Massachusetts, however, some cause outside the destruction of the forests must be sought for; as in the earliest history of the Colony, and long before land enough had been cleared to induce any climatic change, the country was nearly devastated by severe summer droughts, which, if less frequent, were no less violent than those of the present day.

Mr. Calvin Chamberlain, in an able memorial on the subject of forests,* presented to the house of representatives of the State of Maine in 1869, says: "There is a portion of Hancock County (Maine), along the coast, that is now nearly denuded of trees. During the heat of summer, the radiation from the parched surface affects the atmosphere to excessive dryness. The electrical and rain-bearing clouds that approach from the westward, as they come within this dry atmosphere, are absorbed and dissipated before their watery contents can reach the earth; while the clouds just north of them float on over a better wooded district and yield a copious rainfall; and, on the other hand, the showers continue abundant in the more humid atmosphere of the contiguous bays and ocean."

Dr. Lapham† observes that "in the hot and dry plains of our South-western Territories we often see clouds passing overhead that reserve their contents until they have passed from these almost desert regions. These clouds frequently present all the actual appearance of rain in the higher region of the atmosphere, and the fertile-giving drops are seen to fall far down towards the earth, only to be dissolved and dissipated in the lower strata of air, heated by the reflection from the parched earth, which these raindrops do not reach."

As moderators of the extremes of heat and cold, the benefits derived from extensive forests are undoubted, and that our climate is gradually changing through their destruction is

* Agriculture of Maine. Second Series. 1869.

† Report of the Disastrous Effects of the Destruction of Forest Trees now going on so rapidly in the State of Wisconsin. 1867.

apparent to the most casual observer. Our springs are later; our summers are drier, and every year becoming more so; our autumns are carried forward into winter, while our winter climate is subject to far greater changes of temperature than formerly. The total average snowfall is perhaps as great as ever, but it is certainly less regular, and covers the ground for a shorter period than formerly. It is interesting to note in this connection the conclusion which Noah Webster* drew three-quarters of a century ago, showing that, even at that time, before the cutting off the forests had assumed the importance which it does to-day, similar climatic changes were at work. "From a careful comparison of these facts," he says, "it appears that the weather in modern winters in the United States is more inconstant than when the earth was covered with woods, at the first settlement of Europeans in this country; that the warm weather of autumn extends further into the winter months, and the cold weather of winter and spring encroaches upon the summer; that the wind being more variable, snow is less permanent; and perhaps the same remark may be applicable to the ice of the rivers." Mr. Marsh arrives at nearly the same conclusion. "So far as we are able to sum up the results," he says, "it would appear that in countries in the temperate zone, still chiefly covered with woods, the summers would be cooler, shorter; the winters milder, drier, longer than in the same regions after the removal of the forests; and the condensation and precipitation of atmospheric moisture would be, if not greater in total quantity, more frequent and less violent in discharge."

Such changes of climate are everywhere noticed, in countries from which the forests have been extensively removed; and if they are not more apparent in Massachusetts, it is owing to its propinquity to the ocean, which exerts an important, and, of course, perpetual control over the temperature of all regions within its influence, preventing the excessive and sudden changes which often mark an inland climate. But even here there are certain changed conditions which can only find a solution in climatic deterioration traceable to the destruction of the forests.

* A Collection of Papers on Political, Literary and Moral Subjects. New York. 1843.

Twenty years ago peaches were a profitable crop; now we must depend on New Jersey and Delaware for our supply, and our apples and other orchard fruits now come from beyond the limits of New England. The failure of these and other crops in the older States is generally ascribed to exhaustion of the soil; but with greater reason it can be referred to the destruction of the forests which sheltered us from the cold winds of the north and west, and which, keeping the soil under their shade cool in summer and warm in winter, acted at once as material barriers and reservoirs of moisture. It is not necessary to go beyond the limits of the United States for examples of the climatic changes which follow the destruction of the forests. Mr. Chamberlain, in the memorial to which I have already referred, says: "A decline in fruit products in Maine has been apparent for a considerable time; other farm crops are seemingly in a decline also. Potatoes, oats and wheat, now rarely give such crops as they did thirty or forty years ago. Fruit-trees take on disease, apples become scabbed and distorted, pears knotty, cracked, and extremely perverse, plum and cherry-trees forget former habits and old friendships; blight and rust and insect-destroyers are everywhere. The farmer's crops are invaded from all sides. The cry of local exhaustion of the elements of the soil, negligent culture, and a long chapter of local complaints, fail to account for any portion of the difficulty." According to Lapham, the winter in the State of Michigan has greatly increased in severity during the last twenty years, and this severity seems to keep pace with the cutting off of the forests. "Thirty years ago," he says, "the peach was one of the most abundant fruits of that State; at that time frost injurious to corn, at any time from May to October, was a thing unknown. Now the peach is an uncertain crop, and frost often injures the corn." It has been estimated that the same State has lost during four years, twenty millions of dollars from the failure of the winter wheat, a crop which, in the early history of the State, was never injured.

Forests, by preventing the escape of moisture by rapid superficial flow and evaporation, insure, it is now generally acknowledged, the permanence of springs, which in their turn

supply the rivulets from which the great water-courses draw their supply. The water falling on a tract of land stripped of its covering of woods is rapidly evaporated by the summer sun, or in winter rushes off over the surface of the frozen ground to the nearest water-course, converting this for the time being into a roaring torrent. In a country properly wooded, the result would be exactly opposite. The summer rain, falling on the ground, protected by the forest from evaporation, is held as in a sponge, slowly but surely finding its way to the water-courses, while the melting snows and winter rains gradually soak into the soil which in the forests is never so deeply frozen as in the open ground. This is no mere theory, but a fact of which the proof is, alas! too easily found, and too convincing. It is a subject of common remark in the country, that brooks which formerly ran throughout the year, are now dry save after the autumn rains, or the melting of the snows in spring, when they become raging torrents, carrying off to the sea in a few days the water which formerly supplied them with a moderate but constant flow throughout the summer. Unfortunately, no observations of the flow of the great rivers in the United States have been made, covering a period of time of sufficient length, to enable us to draw any conclusions in regard to it. But in Europe this subject has received more careful investigation. Herr Wex, at the recent yearly meeting of the Geographical Society of Vienna, demonstrated that the average level of the river Elbe had fallen seventeen inches; that of the Rhine, over twenty-four inches; that of the Vistula, twenty-six inches; and that of the Danube at Orsova, as much as fifty-five inches during the past fifty years. Accompanying this fall in level, there was also shown to be a constantly increasing diminution of the discharge from springs. Instances, though of less general importance, are not wanting near home. "There * is a good illustration of the effects of the destruction and reproduction of forests in drying up and restoring ponds in my immediate neighborhood. Within about one-half mile of my residence there is a pond upon which mills have been standing for a long time, dating back, I believe, to the first settlement of the town. These have

* Trees of America. R. U. Piper, Boston, 1855.

been kept in constant operation until within about twenty or thirty years, when the supply of water began to fail. The pond owes its existence to a stream which has its source in the hills which stretch some miles to the south. Within the time mentioned, these hills, which were clothed with a dense forest, have been almost entirely stripped of trees; and to the wonder and loss of the mill-owners, the water in the pond has failed, except in the season of freshets, and what was never heard of before, the stream itself has been entirely dry. Within the last ten years a new growth of wood has sprung up on most of the land formerly occupied by the old forest; and now the water runs through the year, notwithstanding the great droughts of the last few years, going back from 1856."

Lapham mentions that "such has been the changes in the flow of the Milwaukee River, even while the area from which it receives its supply is but partially cleared, that the proprietors of most of the mills and factories have found it necessary to resort to the use of steam, at a largely increased yearly cost, to supply the deficiency of water-power in dry seasons of the year. The floods of spring are increased until they are sufficient to carry away bridges and dams before deemed secure against their ravages. What has happened to the Milwaukee River has happened to all other water-courses in the State from whose banks the forests have been removed, and many farmers who selected land upon which there was a living brook of clear, pure water, now find the brooks dried up during a considerable portion of the year."

Many such examples might be instanced to prove that cutting off the forests has a direct influence in diminishing the flow of springs, but I will confine myself to one other.

Marschand, as quoted by Mr. Marsh, cites the following: "The Wolf Spring, in the commune of Soubey (France), furnishes a remarkable example of the influence of woods upon fountains. A few years ago this spring did not exist. At the place where it now rises a small thread of water was observed after very long rains, but the stream disappeared with the rain. The spot is in the middle of a very steep pasture, inclining to the south. Eighty years ago the owner of the land, perceiving that young firs were shooting up in

the upper part of it, determined to let them grow, and they soon formed a flourishing grove.

"As soon as they were well grown, a fine spring appeared in place of the occasional rill, and furnished abundant water in the longest droughts. For forty or fifty years the spring was considered the best in the Clos du Doubs. A few years since the grove was felled, and the ground turned again to a pasture. The spring disappeared with the wood, and is now as dry as it was ninety years ago."

The influence of belts of trees, especially of spiked-leaved species, on local climate is important. Such plantations serve as a material check to the natural force of the cold winds from the north, which rapidly lower the temperature, hasten evaporation, and blow into drifts the snow, which would otherwise protect the ground with an even covering. There is probably no way in which the farmers of this State could more easily or more rapidly increase its agricultural product than by planting such screens from the north-east to the north-west of their farms; and their attention is particularly directed to the importance of this subject. Such plantations would be too limited in extent and too widely scattered to have any general influence on our climate, or the flow of our water-courses; but, as a means of direct profit, it does not seem unreasonable to predict that such protection to our fields would increase the profits of their cultivation fully twenty per cent.

Orchards thus protected are still productive, and all gardeners know that plants generally supposed too tender to support our climate, will thrive when planted under the protection of a garden wall, or among evergreen trees. What garden walls are to the horticulturist, these broad evergreen plantations should be to the farmer.

Mr. J. J. Thomas, as quoted by Lapham, says: "Isaac Pullen, a well-known nurseryman at Hightown, New Jersey, showed me, last summer (1864), several belts of evergreen trees which had sprung up from his nursery rows to a height of twenty-five or thirty feet in ten years, and he stated that within the shelter of these screens his nursery-trees, as well as farm crops, averaged fifty per cent. more than in blank or exposed places."

Becquerel, as quoted by Mr. Marsh, says: "In the valley of the Rhone a simple hedge, two metres in height, is sufficient protection for a distance of twenty-two metres." "The mechanical shelter" says Mr. Marsh, "acts, no doubt, chiefly as a defence against the mechanical force of the wind; but its uses are by no means limited to that effect. If the current of air which it resists moves horizontally, it would prevent the access of cold or parching blasts to the ground for a great distance." "Becquerel's views," says the same author, "have been amply confirmed by recent extensive experiments on the bleak, stony, and desolate plain of the Crau in the department of the Bouches du Rhone, which had remained a naked waste from the earliest ages of history. Belts of trees prove a secure protection even against the piercing and chilly blasts of the Mistral, and in their shelter plantations of fruit-trees and vegetables thrive with the greatest luxuriance." Experiments of a similar nature, and on a large scale, have been made in Holland, and lands, which were formerly considered unimprovable, such was the force of the winds blowing from the North Sea, have been rendered almost the most productive in Europe, simply by sheltering them with rows of trees placed at regular intervals, and at right angles to the direction of the wind.

It appears, then, that in a country in which a due proportion of forest was maintained, it might be expected that local summer showers would probably be attracted; that extremes of temperature both in summer and winter would be prevented to such an extent that additional crops would be made possible; and that the annual rainfall, instead of being rapidly wasted by evaporation, or still more rapidly poured into the sea, would be held in the forest-clad ground, from which it would gradually find its way to the water-courses, which would flow regularly throughout the year, bringing summer verdure to pastures, and assured power to the manufactories along their banks.

But these are national questions, and can only be treated in a broad, comprehensive manner. Let us consider, however, whether Massachusetts is furnishing her quota to the national forest system which would return to our country much of its lost fertility. It has been estimated, and I think

with correctness, that forests, in order to maintain normal physical conditions, and to supply the material so essential to every branch of human industry, should occupy about twenty-five per cent. of the area of the country to be influenced and supplied by them.

By the census of 1870, of the 4,992,000 acres which constitute the State of Massachusetts, only 766,714 were reported as woodlands, or nearly 550,000 acres less than the proper amount. A comparison of Mr. Bigelow's Report on the Industry of Massachusetts for 1837 with the United States census of 1870, shows a decrease in the amount of Massachusetts woodlands of some 23,000 acres. The methods used, however, in preparing the statistics of these two reports were so widely different, that I am inclined to doubt the value of such a comparison, and to coincide with the opinion of many intelligent observers, that the Massachusetts woodlands are at least holding their own in extent; and if we consider the very encouraging attention which has been, for some years, paid to tree-planting for ornamental purposes, it must be conceded, I think, that there is now as large a proportion of Massachusetts covered with arborial growth as at any time during the past fifty years.

As compared with most of the other States of the Union, this condition of things would be extremely gratifying were it due to a desire on the part of our people to maintain a proper proportion of forest within the limits of the State, and not to the forced abandonment of much improved land; the result in no small measure of the folly of those who stripped the land of its protection, and subjected their descendants to the evils I have tried to point out.

Granting that the area covered with forest growth in Massachusetts has not diminished during the last fifty years, we are still short, by over half a million acres, of the amount supposed essential to maintain proper physical conditions; while, if we examine the actual state of the woodlands, it will be found that they are very far from being able to supply sufficient forest products for the requirements of the inhabitants of the State.

The abandoned lands have generally grown up with trees,

comparatively worthless for employment in the arts, and which only supply, after years of struggling growth, an inferior fuel.

The most valuable trees have always been cut, often before they reached maturity, and as no steps have been taken to replace them, it is not astonishing that the poverty of our woodlands has reached a point which compels the inhabitants of the State to draw nearly their whole supply of lumber from portions of the country more recently settled. This is attended with so much expense and inconvenience that many valuable industries have already moved from Massachusetts, and it is not improbable that at no distant day many others depending on the forests for their existence will be compelled to do likewise. By the census of 1870, there were in Massachusetts, besides the woodlands, nearly two million (1,988,-164) acres of unimproved land. Of these, at least 1,200,000 are admirably suited for forest growth, and if planted with trees adapted to the various soils and situations, they would produce at the end of fifty years a crop, the actual value of which in dollars can only be reckoned by hundreds of millions.

It is impossible to estimate the indirect profit of such plantations in improved climate and water-power; but that it would equal or excel the actual value of the timber produced seems not improbable, while the benefits arising from so large an additional area of forest would be felt far beyond the limits of the State. There are in Massachusetts, according to the last returns, 26,500 farms (a falling off of 7,500 since 1850), which average one hundred and three acres in extent. There is not a farm of this size in the State which could not be rendered more valuable if a strip of land, equal to at least one-tenth of its whole area and on its northern boundary, was devoted to a belt of trees, which would serve to protect the remainder from the cold winds of winter, and render its cultivation more profitable and its occupation more agreeable. Such timber-belts would, in the aggregate, give the State 340,000 additional acres covered with trees.

It is true that if the existing woodlands were increased to the extent I suggest, their area would cover not twenty-five, but nearly fifty, per cent. of the whole State. But it must be

remembered that the poverty of the soil and the severity of the climate preclude profitable agriculture from a large portion of Massachusetts, and that the waste lands at least can only be made profitable through sylviculture.

Any fears that the production of such plantations will be greater than the demand, are groundless, as Massachusetts, from her geographical position, can always secure a market for any excess of lumber she can produce beyond the wants of her inhabitants. There is no soil within the State too poor or too exposed, it must be remembered also, to resist the fertilizing effects of fifty years of forest covering; and the fact that properly managed forests, especially when formed of certain trees, have so great an influence in enriching the soil beneath them, should always enter largely into any consideration of the expediency of forest culture.

But few experiments in arboriculture, except on the most limited scale, have been attempted in Massachusetts, but I will briefly describe the two most important which are of special interest, as showing what our unimproved lands are capable of, if judiciously managed. Mr. Richard S. Fay commenced, in 1846, planting on his estate near Lynn, in Essex County, and in that and the two succeeding years, planted two hundred thousand imported trees, to which were afterwards added nearly as many more, raised directly from the seed, nearly two hundred acres being covered in all. The sites of these plantations were stony hillsides, fully exposed to the wind, destitute of loam, their only covering a few struggling barberry bushes and junipers, with an abundant undergrowth of wood-wax (*Genista tinctoria, L.*), always a certain indication in Essex County of sterile soil. He employed in his plantations, oaks, ashes, maples, the Norway spruce, Scotch and Austrian pines; but the principal tree planted was the European larch. No labor was expended on the land previous to planting, the trees, about one foot high, being simply inserted with a spade, and no protection has been at any time given them, save against fire and browsing animals. I recently visited these plantations, twenty-nine years after their formation, and took occasion to measure several of the trees, but more especially the larches. Some of these are now over fifty feet in height, and fifteen inches

in diameter three feet from the ground, and the average of many trees examined is over forty feet in height and twelve inches in diameter. The broad-leaved trees have also made a most satisfactory growth, and many of them, on the margins of the plantation, are fully forty feet high. During the past ten years, about seven hundred cords of firewood have been cut from the plantations, besides all the fencing required for a large estate. Firewood, fence-posts and railroad sleepers, to the value of thousands of dollars, could be cut to-day, to the great advantage of the remaining trees. The profit of such an operation is apparent, especially when we consider that the land used for these plantations did not cost more than ten dollars an acre, and probably not half that amount.

The second experiment was made by Mr. J. S. Fay, a brother of Mr. Fay, of Essex County, on his estate at Wood's Holl, in Barnstable County, on the extreme south-western point of Cape Cod. A tract of land, one hundred and twenty-five acres in extent, which is now densely covered with Mr. Fay's plantations, was, in 1853, seemingly as little fitted for the purpose of tree-culture as can well be imagined. It was fully exposed to the cold north-west winds of winter, sweeping down across Buzzard's Bay, and to the no less baneful south-west winds of summer, which come from the Atlantic loaded with saline moisture.

In answer to an inquiry as to the nature of the soil on which his plantations are made, Mr. Fay writes me: "My land is made up mainly of abrupt hills and deep hollows, sprinkled over with bowlders of granite. The soil is dry and worn-out, and what there is of it, is a gravelly loam. The larger part consisted of old pastures, and on the one hundred and twenty-five acres not a tree of any kind, unless an oak, that sprang out of the huckleberry bushes here and there, barely lifting its head above them for the wind, and when attempting to grow, browsed down by the cattle ranging in winter, could be called a tree."

Thirty-five thousand trees were imported and set out, besides a large number of native trees procured in this country; but fully three-fourths of the whole plantation was made by sowing the seed directly on the ground where the trees were to stand. A large variety of trees, both native and

foreign, were employed, and while few have failed entirely, the foreign species, as was to be expected from the situation, have been the most successful. The Scotch pine has made the most rapid growth, and then the European larch.

The Corsican pine (*Pinus Laricio, Poir.*), although not planted as early as the others, promises to be a valuable and fast-growing tree for planting under such circumstances.

Larch and Scotch pine, transplanted from the nursery in 1853, are now forty feet high, and from ten to twelve inches in diameter at one foot from the ground. Trees of the Scotch pine, raised from seed planted in 1861, where the trees have grown, but in favorable situations, and which have been properly thinned, have been cut this winter, and measured thirty feet in height and ten inches in diameter one foot from the ground, while the average of the trees in a large plantation of Scotch pine, made in the same manner in 1862, and which has received no special care, is twenty feet high and six inches in diameter. Plants of the Corsican pine are now eight feet high in only eight years from seed, the growth of the last three years being over five feet.

When we consider the success which has attended the experiments of these gentlemen in reclothing their property with forest growth, under circumstances, too, as disadvantageous as it is possible for Massachusetts to offer, it must be acknowledged that the attempt to replant our unimproved lands is a perfectly feasible one, and the only wonder is that the inhabitants of Essex and Barnstable counties, with such examples before them, have not already planted their worthless, worn-out lands with a crop which would yield a larger profit than any they have produced since the first clearing of the forest.

Enormously as the price of all forest products has advanced during the last twenty-five years, their future increase in value must be more rapid as the supply becomes more and more inadequate to the demand. The great timber districts of the northern hemisphere have now all been called on to supply the always increasing wants of the civilized world, while no provision has as yet been made, except in limited areas, or on an entirely insufficient scale, to provide artificially the wood on which our descendants must depend.

In Europe, Norway and Sweden, Russia, Germany, and possibly Belgium are the only countries which yield more forest products than they consume; while the other European countries, especially Great Britain and the extreme southern nations, are enormous consumers of imported wood. In the United States, according to Mr. Marsh's estimate, Oregon is the only State in which there is an excess of forest. New York and Maine, which were formerly the chief lumber-producing States of the East, now do not cut enough for the use of their own inhabitants, and depend on Canada for a large portion of their supply. And this seems to be true of all the States of the Union, with the exception of Pennsylvania, Colorado, Oregon, Florida, Michigan, Wisconsin and Minnesota.

The annual forest destruction in the three last States is enormous, and they must soon depend on extraneous sources for their domestic supply. According to an article in the "St. Louis Republican," quoted by Mr. Marsh, 3,311,372,225 feet of lumber were cut in 1869 in these three States, from 883,-132 acres; and the same article estimated that there were only about 15,500,000 acres of forest left in these States to be cut off, or only fifteen or twenty years' supply. When this is gone, the world will be deprived of one of its richest stores of lumber.

How long the supply in the British Possessions in North America will last, it is impossible to estimate. Heavy drains are already being made on it. During the three years ending June 30, 1871, the Dominion of Canada exported lumber to the value of $63,131,608, *gold;* the trade increasing during that time about $1,000,000 each year.

In spite of the substitution in many parts of the country of coal as fuel, both for domestic purposes and for the generation of steam; in spite of the increasing employment of other material, both in the construction of buildings and various implements, and for ship-building, the demand for wood in the United States has stimulated the supply until the figures which mark its increase seem almost incredible.

The railroads are enormous consumers, both in fuel, in the construction of cars and buildings, and for sleepers. "The Monthly Report of the Bureau of Agriculture" for November and December, 1869, estimated that the annual expenditure

of the railroads at that time for wood for buildings, repairs and cars, was $38,000,000, and that the locomotives of the United States consumed $56,000,000 worth for fuel annually. Supposing this is correct, and that the wood is worth four dollars a cord (a very small estimate), this yearly consumption of fuel by the railroads would represent twenty-five years' growth on 350,000 acres.

By the last returns there are in the United States 72,633 miles of railroad in operation, and the addition of double tracks and sidings will probably increase this amount to 85,000 miles.

Supposing the life of a sleeper is seven years, the 85,000 miles of track consume annually 34,000,000 sleepers, or thirty years' growth on 68,000 acres of the best natural woodlands; or if the sleepers are raised artificially, some 700,000 acres would be required, planted with trees best adapted for the purpose, regularly cropped and scientifically managed, to supply the railroads already constructed. At least 125,000 miles of fencing are required to inclose the railroads of the country, which could not have cost on an average less than $700 a mile. One-half of this would barely represent the cost of the wood employed, or $43,000,000; while it must take annually lumber to the value of not less than $40,000,000 to keep these fences in repair.

By the last return I have seen (1872), there were in operation in the United States 65,000 miles of telegraph, which destroyed in their construction 2,600,000 trees for poles, while the annual repairs must call for some 250,000 more.

The 20,000,000,000 matches manufactured in the United States annually require, according to Mr. Marsh, 230,000 cubic feet of the best pine lumber.

At least 1,450,000 cords of wood, principally pine, were required to bake the 2,899,382 thousand bricks which the census of 1870 gives as the number made in that year, requiring the cutting off the trees from 36,000 acres.

The manufacture of shoe-pegs (a Massachusetts industry, but now carried on beyond the limits of the State for want of material here) consumes annually 100,000 cords of white birch worth $1,000,000.

In 1850, the value of the pine packing-boxes made in the

United States was one million dollars; in 1870, they were valued at $8,200,000. The value of the material made into woodenware in the United States increased from $436,000 in 1850, to $1,600,000 in 1870. The value of the material converted into agricultural implements in the United States in 1850 was only $8,000,000, while in 1870 it had reached the enormous sum of $73,000,000, of which the forests must have furnished twenty millions' worth. The enormous consumption of wood in this country will, however, be sufficiently shown by the following figures.

In 1860, the value of logs sawed into lumber was $43,000,000; in 1870, it was over $103,000,000,—an increase which neither the growth of population or the general advance in all prices can account for, and which can only be explained by the supposition that the uses to which forest products are applied are being rapidly extended, and that the foreign demands on American forests are increasing. But the statistics of the lumber trade do not show the entire destruction which is going on in our forests. Mr. Frederic Starr, Jr.,* in an interesting paper on the American forests, estimated that during the ten years between 1850 and 1860, 30,000,000 acres of forest-covered land were cleared in the United States for agricultural purposes, or ten thousand a day for each working day during that time. Of the trees thus cut, probably the largest portion never found their way to market, but were destroyed by fire for the sake of getting them off the land as rapidly as possible; and although lumber is now too valuable to justify any such mode of clearing, it is not improbable that trees capable of producing millions of feet are annually sacrificed in this manner.

These facts and figures prove, whatever other objections there may be to re-covering a portion of this State with forest growth, that the farmers will not want a market for all the lumber they can produce, and at prices far above those of the present time.

In order that any system of arboriculture may be successfully carried out, it is necessary to consider what trees, both native and foreign, can be grown in this State to the greatest

* Report of Department of Agriculture, 1865: American Forests; their Destruction and Preservation. By the Rev. Frederic Starr, Jr., St. Louis.

advantage; and the profits of such an undertaking as I advocate will be immensely increased, if suitable selections for the various situations of soil and climate are made.

The sugar-maple, the white elm, and the white ash reach their greatest perfection in this and the neighboring States, and should be generally planted wherever the soil will permit. The product of the white oak and the hickories is of such value that they should also be generally planted, although they require a more genial climate and deeper soil than Massachusetts can now offer to develop their best qualities.

The white cedar *(Cupressus thyoides, L.)*, although we are here on its northern limit, where it only attains a moderate size, should be planted on account of the value of its wood for fencing and other rural purposes, boat-building, shingle-making, etc., but more especially on account of its natural place of growth, which is always in deep, cold swamps, often near the sea, and overflowed by high tides, a situation in which no other tree of an equal commercial value could possibly thrive.

The value of the white pine is so thoroughly understood, and this beautiful tree grows so rapidly wherever it finds a certain amount of shelter and protection, that it is needless to advance its claims on the planter.

In consideration of its market value at all ages, the rapidity of its growth, and the length of time it continues to throw up suckers, the white ash *(Fraxinus Americana, L.)* is the most valuable of all our native trees for planting in this State. Valuable as Massachusetts-grown white oak is, it can never compete with that produced in other sections of the country for purposes which call out its highest qualities; while the slowness of its growth, and the difficulties which attend the early years of its cultivation, seem still further to reduce its value for the general planter as compared with the ash. Already there is a rapidly increasing export trade of ash lumber to Europe, Australia and the Pacific coast, from Boston and New York, and the possibilities of this business can only be limited by the supply. The American is generally acknowledged to be superior to the European ash in the qualities for which it is specially valued, toughness and elasticity, and in which no other wood can equal it. Australia

possesses no other tree which is at all its equal for carriage-building, while west of the Rocky Mountains there is but a single one which can supply its place; an ash *(Fraxinus Oregana, Nutt.)* which, developing into a large and valuable timber tree in Oregon, is less frequent and less valuable south of the California line. Of the economic value of several ashes which grow on the Eastern Asiatic seaboard, nothing is as yet known. It seems, then, that the New England States could command the markets of the world for one of the most useful and valuable of all woods, had they but a sufficient supply to offer.

According to Mr. Thomas Laslett,* Timber Inspector to the British Admiralty, the specific gravity of American ash is 480, while that of the European is 736. The former is, therefore, on account of its greater lightness, far more valuable for the handles of shovels, spades, hoes, rakes and other hand implements.

According to the United States census of 1870, the number of spades, shovels, rakes, hoes, and hay-forks made in that year was 8,347,478, and as our exportation of such implements is rapidly increasing, although still in its infancy, it is evident that the value of ash will be greatly enhanced at no distant day. It is also used in making ships' blocks, in turnery, and for making the oars of boats. In speaking of the white ash, Laslett says: "It stands well after seasoning, and hence we get from this tree the best material for oars for boats that can be produced. They are much and eagerly sought after by foreign governments as well as our own, and also by the great private steamship companies and the mercantile marine of this country; consequently there is often a very keen competition for the possession of them." The manufactory of oars (surely a seaboard industry), in pursuit of material, moved from Massachusetts first to Maine, and then to Ohio and other Western States.

Ash is coming into extensive use for expensive furniture and for the interior finish of houses, while an immense number of the young saplings are annually consumed in the coopers'

* Timber and Timber Trees, Native and Foreign. By Thomas Laslett, Timber Inspector to the Admiralty. London, 1875.

trade. Its value for firewood, according to Bull,* is 77, the standard hickory being 100, while only four other American woods are its superior in heat-giving qualities.

In view of its many uses for purposes for which no other wood can supply its place, it is not astonishing that the value of ash lumber has largely increased of late years. The present price in the Boston market of the best New England ash is eighty-five dollars the one thousand feet, or about fifteen dollars higher than that grown in the West.

To develop its best qualities, the white ash should be planted in a cool, deep, moist, but well-drained soil, where it will make a rapid growth. That the plantation may be as early profitable as possible, the young trees should be inserted in rows three feet apart, the plants being two feet apart in the rows. This would give 7,260 plants to the acre, which should be gradually thinned until 108 trees are left standing, twenty feet apart each way. The first thinning, which might be made at the end of ten years, would give four thousand hoop-poles, which at present price would be worth four hundred dollars.

The remaining thinnings, made at different periods up to twenty-five or thirty years, would produce some three thousand trees more, worth at least three times as much as the first thinnings. Such cuttings would pay all the expenses of planting, the care of the plantation and the interest on the capital invested, and would leave the land covered with trees capable of being turned into money at a moment's notice, or whose value would increase for a hundred years, making no mean inheritance for the descendants of a Massachusetts farmer. The planting of the white ash as a shade and road-side tree is especially recommended, and for that purpose it ranks, among our native trees, next to the sugar-maple.

The best hickories are not produced in Massachusetts, although in the western part of the State, especially in the valley of the Connecticut, and in other favorable situations, the natural growth of this tree is fine enough to warrant its extensive cultivation. The hickories should be cultivated in the same manner as recommended for the ash, the young plants being

* Experiments to determine the Comparative Value of the principal Varieties of Fuel. T. Bull. Philadelphia.

equally valuable for hoop-poles, walking-sticks, and similar purposes; while the lumber cut from the large trees brings a higher price than any other produced in the Northern States. It is used extensively in carriage-building and for axe handles, in which form it is carried all over the world. Hickory makes better fuel than any other wood with which we are acquainted, and is always the standard by which the value of other woods for this purpose is estimated. The best hickory is worth, in the Boston market at the present time, one hundred dollars the one thousand feet. In the form of firewood it now seldom comes to the Boston market, where it readily commands, however, sixteen dollars the cord, and in nearly every part of the State it is worth from eight to ten dollars a cord for curing hams and bacon, for which purpose no other wood supplies its place. The shagbark hickory *(Carya alba, Nutt.)*, which also produces the finest fruit, and the pignut hickory *(Carya porcina, Nutt.)*, are the most valuable species for cultivation in Massachusetts.

In the valley of the Connecticut the American elm develops its noblest proportions, and there possibly earns the title of the "most magnificent vegetable of the temperate zone," bestowed on it by the younger Michaux. Except, however, in very favorable situations, where its roots can find their way in deep, cool soil, supplied with abundant moisture, the American elm is far from a beautiful tree. In the situations I have described as being favorable to it, the American elm should be largely planted, not only on account of its beauty, rapid growth, and long life, but for the value of its wood, which has many uses, the most important being its employment for the hubs of carriage-wheels.

The sugar-maple *(Acer saccharinum)* nowhere becomes a finer tree than in the western portions of Massachusetts; and when we consider the value of its wood in the arts, and for fuel, the value of its sap when converted into sugar, its rapid growth, long life, immunity from the attacks of insects, and its beauty and fitness for street and ornamental planting, it must be acknowledged that no tree deserves more general cultivation in this State. The wood of the sugar-maple, which is hard, close-grained and smooth, is largely used in furniture-making, cooperage, and in making shoe-lasts, for which it is preferred

to that of any other tree. Two million five hundred thousand pairs of lasts are consumed annually in Massachusetts alone; and if we can judge of the future of this business by its past history, it will, before many years, consume all the sugar-maple lumber the country can produce. For fuel, the wood of this tree is generally considered superior to that of any other, with the exception of the hickory. Mr. Bull estimates its value at only 60, hickory being 100, and places before it, in heat-giving qualities, no less than twenty-two species of North American trees and shrubs.

The destruction of the sugar-maple has been so general in this State, that sugar-making, which formerly held an important place in Massachusetts industry, has, during the last thirty years, diminished fully one-half, and that, too, in the face of an enormously increased natural production, and of prices which have considerably more than doubled during the last forty years.

There are, especially in the western part of the State, many unproductive pastures, now almost worthless, which would, if converted into sugar-orchards, yield in a few years a handsome income.

In regard to the age at which it is profitable to commence drawing the sap for sugar, authorities differ; but a tree twenty-five years old will yield, on the average, ten pounds of sugar, and will continue to be productive to this extent for fifty or sixty years longer. One hundred and sixty trees being allowed to the acre, the sugar-crop, from an orchard of that size, would yield, at present prices, $273 annually; and it must be remembered that, owing to the season of the year at which sugar is made, no operation of the farm can be carried on with so small an outlay for labor. The trees, uninjured by the drawing off the sap, would increase in value for a hundred years, and, at any age, find a ready sale, either for fuel or for use in the arts. Its adaptability to all soils, except where stagnant water stands, the rapidity of its growth, its general thriftiness and undoubted beauty at all seasons of the year, render the sugar-maple the most valuable of all the North American trees for street and roadside planting, and it should be more generally used instead of the American elm, which has been planted for this purpose in

Massachusetts almost to the exclusion of other trees, although rarely thriving in such dry, dusty situations.

As I have before remarked, the value of the white oak (*Quercus alba*, *L.*), for all purposes requiring durability, toughness and hardness, is so great, that it must always be in demand, no other North American wood equalling it in these qualities. And although I do not believe that its cultivation in Massachusetts can ever be as profitable as that of the ash or the hickory, it should always form a part of mixed plantations, and should be spared, in thinning woodlands, in preference to all other trees, on account of the slow growth of its early years, and its value at maturity. The value of the white oak for fuel is very great, being, according to Bull, 81 to hickory's 100, the hickories and the swamp white oak alone surpassing it in this quality.

There are a few European trees which have now been sufficiently tested here to show that they are suited to the soil and climate of Massachusetts, and that the qualities for which they are held in high esteem in other countries would make their cultivation equally valuable here.

The common European elm (*Ulmus campestris*, *L.*) was introduced into Massachusetts more than a century ago. According to Dr. Shurtleff,* Major Paddock, a carriage-builder by trade, and therefore probably fully aware of the economic value of the tree, planted the row of English elms in front of the Granary burying-ground in Boston about the year 1762, and as the trees had been grown in a nursery at Milton for some time previous to their being planted in Boston, it is not improbable that they were imported fully a hundred and twenty-five years ago. In spite of the hard treatment which seems the destiny of all trees intrusted to the care of our city fathers, one of the row had in 1860 reached, according to Dr. Shurtleff's measurement, the respectable size of twelve feet eight inches in circumference at three feet from the sidewalk. Other trees of this importation were doubtless planted in the neighborhood of Boston, and I have recently measured two growing in Jamaica Plain which could not have been planted much later. One of these, at four feet

* Topographical and Historical Description of Boston. Nathaniel B. Shurtleff. Boston, 1872.

from the ground, measures seventeen feet two inches in circumference, and the other sixteen feet ten inches at three feet.

Several trees in Brookline, which were planted in 1805, when they might have been ten years old, are now eighty feet high, and average from eight feet to eight feet six inches in circumference at three feet from the ground. It would, from these examples, seem that the European elm not only grows rapidly in the eastern part of the State, but promises to attain its largest dimensions and full span of life. I have been unable to compare satisfactorily the rapidity of its growth with that of the American elm, but probably in its best condition the latter is of far more rapid growth, although in the ordinary situations where the elm is planted, and where it generally suffers from insufficiency of root-moisture, the European elm is immeasurably its superior in rapidity of growth, length of life, and general thriftiness. The fact that the European is fully a month longer in leaf than the American elm, that its tougher leaves would seem to offer a less appetizing food to the canker-worm, the greatest enemy of the American elm in New England, and its adaptability to all situations, are strong arguments in favor of giving the preference to the former for general cultivation.

Its thriftiness in smoky situations, makes the European elm the most valuable tree our climate will allow for city street and square planting, and as a shade-tree by roadsides, no American tree is its equal.

The economic value of the wood of the European, which is hard and fine, has always been generally acknowledged to be superior to that of the American elm, and in Europe it is devoted to many important uses. For the hubs of carriage-wheels, it is used almost to the exclusion of all other wood. If employed in situations where it is constantly under water, or kept perfectly dry, it excels almost every other wood in durability. It is considered the best timber for ships' keels. It is largely used for ships' blocks, and for pumps, piles and water-pipes, and by the turner and cabinet-maker, and by the coffin-maker it is preferred to all other woods. The general cultivation of the European elm would add a valuable timber-tree to the products of Massachusetts.

As timber-trees, some of the willows deserve more atten-

tion than they have hitherto received in this country, for, although the white willow *(Salix alba, L.)* has for many years been planted in Massachusetts for ornamental purposes, its economic value has been entirely overlooked. It grows rapidly here, reaching its largest size and developing its best qualities. By the side of the highway, leading from Stockbridge to Great Barrington, in Berkshire County, there is a willow which, at four feet from the ground, girts twenty-one feet eight inches, and which, according to a popular tradition of the neighborhood, was brought in the form of a riding-switch by a person travelling from Connecticut, and planted where it now stands, in the year 1807. According to Newlands,* *Salix fragilis, L.*, or as it was more commonly known, *Salix Russelliana, Smith* (the Duke of Bedford's willow), produces the most valuable timber of any of the family, the common white willow coming next. I am not aware that the Duke of Bedford's willow has ever been introduced into this State; but as the two species have the same geographical range, and grow naturally under precisely similar conditions, there is no doubt that it can be successfully cultivated in any part of Massachusetts. Few trees grow more rapidly than the willow, or adapt themselves to a greater variety of soil. It has been general in this State to select low, undrained situations, beside streams or stagnant ditches, for planting this tree, but it is equally suited to high, exposed places, and poor soil; where, however, its growth will be naturally less rapid. In Europe, the timber of the willow I have referred to is used for many purposes. Newlands says it is "sawn into boards for flooring, and into scantlings for rafters; and in the latter capacity, when kept dry and ventilated, it has been known to last one hundred years. But the purposes more peculiarly its own are such as require lightness, pliancy, elasticity and toughness, all of which qualities it possesses in an eminent degree. It also endures long in water, and therefore is in request for paddle-wheel floats, and for the shrouding of water-wheels. It is used in lining carts for conveying stores or other heavy material, as it does not splinter, and the same quality renders it fit for guard-posts or fenders." Turners and tray-makers find many uses for

* Carpenter's and Joiner's Assistant. James Newlands. London, 1867.

willow-wood, and it is employed in making shoe-lasts, light ladders and the handles of light agricultural implements. Its incombustibility is so great that it is peculiarly suited for the flooring of buildings intended to be fire-proof, and attention has been recently called to its value for such purposes.

As willow timber could be produced far more cheaply than that of any of our native trees, it would soon come into general use here for the purposes for which it seems particularly fitted, and for which more valuable woods are now employed. Less than one-third of the willow used in the United States in basket-making is produced here, the remainder being imported from Great Britain, France and Belgium, at an annual cost of $5,000,000.

The osier proper, the product of *Salix viminalis*, *L.* and its allies, can be grown without trouble in any wet, undrained soil, capable of producing little else of value; but the better sorts of basket-willow are only successfully produced with careful cultivation on rich, well-drained soil. Under such conditions it is a profitable crop, capable of netting at least $150 a year to the acre, and well worth the attention of our farmers. Further experiments, which might be made under the auspices of the county societies, are, however, required to determine which of the many basket-willows is best adapted to our climate, and to devise some method for protecting this crop against the attacks of many insects which have of late years seriously interfered with its cultivation in various parts of the United States.

In spite of the beauty and great economic value of the white pine, there are many situations in this State where its cultivation is almost impossible, and where it should be replaced by its relative the Scotch pine *(Pinus sylvestris, L.)* of the north of Europe. It is many years since this tree was first introduced for ornamental purposes in Massachusetts, where it finds itself perfectly at home, and grows rapidly, soon becoming a large tree on poor soil and in exposed situations. Under such conditions, we usually find the ground covered with a spontaneous growth of the pitch pine, and wherever this tree grows naturally, it is certain that the infinitely more valuable and beautiful Scotch pine will flourish. If Mr. Fay's success with this tree can be taken as a criterion,

the whole of Cape Cod, to its eastern extremities, could be covered with sufficiently large tracts of the Scotch pine to render the remaining portions better suited for agricultural purposes; while the product of such plantations in Barnstable and the other eastern counties in the shape of fuel for brick-baking, would always find a ready market, taking the place of the imported firewood from the shores of the Bay of Fundy, already nearly stripped of its forest growth to supply the increasing demand of Boston and the other New England seaports.

But fuel is the least valuable use to which the wood of the Scotch pine can be turned. In Europe the lumber from this pine is considered more valuable than that of any other coniferous tree, the larch excepted, and for all economic purposes it is rated far above American white pine.

The nature of these two woods, and the uses to which they are each specially adapted, are so dissimilar, that any comparison between them is not particularly interesting. A number of experiments* made at the Royal Woolwich Dockyard have shown that the wood of the Scotch pine will resist a transverse strain .11 greater than that of the white pine; that its resistance to a tensile strain is about twice as great, and its resistance to a vertical strain is .56 greater; while its specific gravity is 541 to 513 for the white pine. All European writers on timber, from Duhamel to Laslett, agree that the wood of the Scotch pine is the most durable pine wood.

Newlands says "the lightness and stiffness of the Scotch pine render it superior to any other kinds of timber for beams, girders, joists, rafters, and indeed for framing in general."

From its greater strength, spars, top-masts, and the masts of small vessels which are often subjected to violent and sudden shocks, are made from the Scotch pine, in preference to any other wood, although, on account of its greater lightness, the white pine is preferred for heavy masts and large spars. Since the supply of larch has become entirely inadequate to the demand, the Scotch pine is used in Europe for railroad sleepers more generally than any other tree, enormous quantities even being shipped from the northern ports to India for this purpose.

* Timber and Timber Trees. Laslett. London, 1875.

Although the wood of the white pine is undoubtedly superior to the Scotch for all purposes where a soft, light, easily worked, clear wood is demanded, the latter has qualities so desirable that its cultivation for economic purposes would be of great value in this State, especially when it is remembered, as I have before remarked, that it will grow rapidly in situations where the white pine cannot flourish.

The rapidity of its growth in all situations, and its economic value, make the Scotch pine the most valuable tree farmers can plant for screens and wind-breaks about their fields and buildings, and for this purpose it is recommended in place of the more generally planted Norway spruce, which, although of rapid growth, in its young state, does not promise, in our climate at least, to fulfil the hopes which were formed in regard to it. The Scotch pine is being so extensively planted in Europe that it is propagated in immense quantities, and at low rates. Plants one foot high can be delivered in any part of this State for from forty to fifty dollars the ten thousand.

There is no tree capable of producing so large an amount of such valuable timber in so short a time as the European larch *(Larix Europea, DC.)*, in countries where its cultivation is possible. A native of high elevations in Northern and Central Europe, and always growing on poor, gravelly and well-drained soil, it is not surprising that when planted under exactly opposite conditions, as is often the case, it does not become a valuable tree. The rocky, well-drained hillsides so common in Massachusetts, are admirably suited to the cultivation of the larch; and there is but little land within the limits of the State too poor or too exposed to produce a valuable crop of timber, if planted with this tree.

The European larch has always been a favorite for ornamental planting here, and has shown itself well adapted to our climate. I cannot discover when this tree was first planted in Massachusetts, but in the eastern part of the State specimens, in open situations, are abundant, sixty feet high and five feet in girth three feet from the ground. The largest specimen of the European larch in Bartram's Botanic Garden, near Philadelphia, probably the first ever sent to America, when examined by Mr. Meehan,* over twenty years ago,

* The American Hand-book of Ornamental Trees. Thomas Meehan.

measured 108 feet high and 5 feet 4 inches in circumference.

The economic uses of the larch are numerous and important. According to Newlands, the strength of larch timber is to that of British oak as 103 to 100; its stiffness as 79 to 100; while its toughness is as 134 to 100. In the most trying circumstances in which timber can be employed, where it is alternately subjected to the influence of air and water, it is the most durable wood known. Laslett states on what he considers good authority that "many of the houses in Venice are built on larch piles, particularly those of which the supports are alternately exposed to wet and dry, and that many of these piles, after being in place for ages, are said not to have the least appearance of decay."

At the request of the Duke of Athol, experiments with a view of testing the durability of the larch, were made many years ago in the River Thames. The result of these experiments is found in Sir Thomas Dick Lauder's* edition of Gilpin. "Posts," he says, "of equal thickness and strength, one of larch and the other of oak, were driven down facing the river wall, where they were alternately covered by water by the flow of the tide and left dry by its fall. This species of alternation is the most trying of all circumstances for the endurance of timber, and accordingly the oaken posts were decayed, and were twice replaced in the course of a very few years, while those that were made of larch remained altogether uninjured."

In Europe, larch is preferred to all other woods for railroad sleepers, and it is probably superior for this purpose to the wood of any North American tree. Larch fence-posts are also in great demand at high prices, and instances are abundant of its great durability when thus employed. A practical forester,† speaking of this tree, says: "For out-door work it is considered the most durable of all descriptions of wood. The lengthened period that some larch posts have stood is quite surprising, some of which are known to the writer to

* Gilpin's Forest Scenery. Edinburgh, 1834.

† Christopher Young Michie, in Transactions of the Scottish Arboricultural Society. Vol. V., part II. Edinburgh.

have stood nearly fifty years, than which there can be no better proof of its durability." For posts, it will probably equal in durability our red cedar, while in the power to hold nails it is greatly its superior.

The European must not be confounded with the American larch, which, although a valuable tree for many purposes, does not make durable fence-posts. Timber of the European larch is admirably adapted for rafters, joists, and the main timbers in large buildings. When sawn into boards, however, it has the serious drawback of excessive shrinkage, and a tendency to warp in seasoning, and is therefore rarely used in this form. Its principal uses in this country would be for railroad sleepers, fence-posts, telegraph posts, hop and bean poles and other rustic work, and for piles in bridges, wharves, and similar structures, where the rising and falling of the tide requires the employment of the most durable timber possible. White oak is generally thus employed, but it is probably less durable than larch, and far too expensive. The fertilizing effects of a plantation of larch on poor, almost barren ground, is remarkable, and now universally acknowledged.

According to a writer in the Highland Society's Transactions, quoted by Loudon, the pasturage under a plantation of larches thirty years old, and which had been thinned to four hundred trees to the acre, produced in Scotland an annual rental of eight or ten shillings the acre, while the same land, previous to the introduction of the larch, was let for one shilling the acre. Grigor * calls attention to the same good result of planting the larch. "No tree," he says, "is so valuable as the larch in its fertilizing effects, arising from the richness of the foliage which it sheds annually. In a healthy wood the yearly deposit is very great; the leaves remain, and are consumed on the spot where they drop, and when the influence of the air is admitted, the space becomes clothed in a vivid green, with many of the finest kinds of natural grasses, the pasture of which is highly reputed in dairy management. And in cases where woodland has been brought under grain-crops, the roots have been found less difficult to remove than those of other trees, and the soil has been rendered more fertile than that which follows any other description of timber.

* Arboriculture. John Grigor. Edinburgh, 1868.

Already in some of the Western States great interest is taken in the cultivation of the European larch, owing principally, I believe, to the efforts of Mr. Robert Douglas, of Waukegan, Illinois, and large numbers are planted annually, with every prospect of success. In his wholesale catalogue for 1876, Mr. Douglas calls attention to the fact, that the president of the Illinois Central Railroad, after an examination of the larch forests of Europe, and the growth and quality of this timber produced in Illinois, has without solicitation offered to transport European larch free of charge to any point on his lines in Illinois and Iowa, provided they are to be planted in the vicinity of the road.

Judging from the growth made by the larches in Mr. Fay's plantation, which are the only ones I know in this State offering any valuable statistics in regard to the rapidity of growth of this tree, I think we can feel confident that on the ordinary soil suited to their culture, larch, planted when about one foot high, and three years old, will in twenty years average twenty-two feet in height, and seven inches in diameter, three feet from the ground; and that in thirty years they will be from thirty-five to forty feet high, and twelve inches in diameter; and if the plantations are thinned to four hundred trees to the acre, that at the end of twenty years more, or fifty years from the time of planting, the trees will reach from sixty to seventy feet in height, and at least twenty inches in diameter. This is also the average growth of this tree in the Highlands of Scotland, under nearly similar conditions.

Let us consider what profits a plantation of larch, ten acres in extent, and intended to stand for fifty years, would give. The labor of cutting the trees will be more than paid for by the sale at different periods of a large amount of small wood suited to many rustic purposes, but for which no credit is made. It must also be remarked that the following account is charged with a permanent wire-fence, although it is more than probable that any land suited to this purpose, is already surrounded by stone-walls, which would require but little subsequent care. Present prices for forest products are taken, without allowance being made for their probable future increase in value.

ESTIMATED PROFITS OF A PLANTATION OF EUROPEAN LARCH OF TEN ACRES, TO LAST FIFTY YEARS.

Dr.		
Ten acres of land, @ $20,		$200 00
Wire fence,		1,000 00
Plants, 27,200, @ $5,		136 25
Labor of planting,		500 00
		$1,836 25
Interest on investment, as above, 50 years, @ 6 per cent.,		5,499 00
Taxes, 50 years, @ 1.5 per cent.,		150 00
Interest on taxes equal 25 years, @ 6 per cent.,		225 00
		$7,710 25
Cr.		
Product of first cutting at the end of 20 years: 13,000 trees, less 20 per cent. for casualties; 10,400 trees, or 20,800 fence-posts, @ 20 cts.,		$4,160 00
Product of second cutting at the end of 30 years: 100,200 trees, less 10 per cent. for casualties; 9,180 trees, or 18,360 sleepers, @ 50 cts.,	$9,180 00	
And 9,180 fence-posts, @ 25 cts.,	2,295 00	
		$11,475 00
Product of third cutting at the end of 50 years: 4,000 trees, less 5 per cent. for casualties; 3,800 piles, worth $5 each,	$19,000 00	
And 7,600 sleepers, worth 50 cts.,	3,800 00	
		22,800 00
Land at cost,		200 00
		$38,635 00
Thirty years' interest on $4,160, @ 6 per cent.,	$7,488 00	
Twenty " " on $11,475, @ 6 per cent.,	13,770 00	
		21,258 00
		$59,993 00
Profit,		52,282 75*

There are within the limits of the State fully 200,000 acres of unimproved land which could with advantage be at once covered with larch plantations.

For the sake of keeping these estimates within reasonable bounds, let us suppose that these 200,000 acres will, in the

* Equal to about 13 per cent. per annum for the entire fifty years, after retaining the original capital invested.

natural course of events, produce during the next fifty years one hundred cords of firewood to the acre, worth six dollars a cord. This would make their total yield for the fifty years $120,000,000. If they were planted with larch, their net yield, according to my estimate, during the same time, would be $1,045,660,000; but that we may judge how much such an operation would add to the wealth of the community, we must deduct from this amount the value of the wood which we suppose would be produced naturally, or $120,000,000. That sum being subtracted, we have left as created wealth the respectable sum of $925,000,000.

There is no branch of agriculture at once so pleasant and so productive of possible gains, as farming *on paper*. It is a dangerous pastime, however, and often leads into grave errors, and great dangers, as the agricultural population has learned to its cost. In this case it will be well to be on the safe side. The larch, in common with other plants, is liable to disease; it is preyed on by many insects, and our plantations may be often injured by fire, bad management, and other dangers now unforeseen.

In view of such chances, let us reduce the total yield of our ten acres of larch a little more than one-half, and be content with a profit of only six per cent. per annum on the capital invested.

Such a diminution of yield would reduce the amount I suppose would spring, in the course of fifty years, from the 200,000 acres of larch, to $402,830,000.

If we we can add eight millions of dollars annually to the net product of the agriculture of Massachusetts by replanting a small portion of our nearly worthless lands with trees, the mere material gain to our wealth is worth striving for. But when we consider that this is an operation which will bring benefits to the State far beyond any direct material gain, it becomes the moral duty of every citizen to continue his efforts in this direction, until every land-owner shall be convinced that tree planting is a patriotic act, and that we owe it to our descendants to leave the land at least as productive and pleasant as we received it. It is within the power of many to give direct assistance to such an undertaking. The wealthy and powerful corporations depending on a supply of water for

their existence, will do well to reflect on the dangers which threaten them through the destruction of the forests, and consider what steps they can take to avert them.

The railroads, the most dependent of all our corporations on a supply of wood for their daily consumption and increased traffic, must soon, in self-defence, turn their attention to arboriculture. But, in this community, we must look to individual enterprise and individual intelligence if we expect to see any considerable portion of this State re-covered with forest growth; and to the farmers, more than to any other class, must be left the solution of the difficulties and dangers, which the forest question presents.

To-day, I can offer them no better advice than that of the dying old Scotchman to his son—"Ye may be aye sticking in a tree, Jock; it will be growin' when ye're sleepin'."

The report was accepted, when the Board adjourned.

Third Day.

The Board met at ten o'clock, A. M. Major S. B. Phinney in the chair.

Present: Messrs. Baker, Bennett, Davis, Dwight, Fenn, Goessmann, Hadwen, Holland, Knowlton, Knox, Ladd, Loring, Merrill, Moore, Perry, Phinney, Saltonstall, Sargent, Shepley, Metcalf J. Smith, Milo J. Smith, Stone, Vincent, L. P. Warner, W. L. Warner, and Wilder.

Mr. W. L. Warner submitted a report upon the assignment of delegates, as follows:—To the

Essex,	George M. Baker.
Middlesex,	Leverett Saltonstall.
Middlesex North,	Eliphalet Stone.
Middlesex South,	Solomon Lincoln.
Worcester,	Alexander Macy, Jr.
Worcester West,	Elijah Perry.
Worcester North,	E. C. Hawks.
Worcester North-West,	William Knowlton.
Worcester South,	Horace P. Wakefield.
Worcester South-East,	Courtlon Sanderson.

Hampshire, Franklin and Hampden,	DANIEL DWIGHT.
Hampshire,	JOHN A. HAWES.
Highland,	STEPHEN SHEPLEY.
Hampden,	JOHN B. MOORE.
Hampden East,	L. P. WARNER.
Union,	MARSHALL P. WILDER.
Franklin,	O. B. HADWEN.
Deerfield Valley,	ADDISON H. HOLLAND.
Berkshire,	W. L. WARNER.
Housatonic,	PAUL A. CHADBOURNE.
Hoosac Valley,	EDMUND H. BENNETT.
Norfolk,	GEORGE B. LORING.
Bristol,	HEBRON VINCENT.
Bristol Central,	J. N. BAGG.
Plymouth,	MILO J. SMITH.
Hingham,	S. B. PHINNEY.
Marshfield,	METCALF J. SMITH.
Barnstable,	DANIEL B. FENN.
Nantucket,	JOHN E. MERRILL.
Martha's Vineyard,	FRANKLIN C. KNOX.

The report was accepted, and the assignment made accordingly.

Mr. VINCENT submitted an essay upon the

MENTAL FACULTIES OF DOMESTIC ANIMALS.

A treatise on the Mental Faculties of Domestic Animals may properly be denominated comparative mental philosophy, analogous to comparative anatomy and physiology. There is a similarity between such animals and human beings in the cerebral organism. But a more striking proof of corresponding elements in animals is seen in the outward manifestations of those qualities, going to show, as I think, mental faculties to some extent, and in some degree, similar to such powers in the human species.

In any examination of this subject, it would be proper first to state what the acknowledged mental faculties of man are, and then to show by known facts, as exhibited by the animals themselves, the evidences of the existence of such corresponding faculties in them, and, as far as might be, their extent. The human mind is our conscious existence, and its powers we denominate its faculties. The senses of touch, vision, hearing, smell and taste are commonly regarded as the

main channels through which impressions are made upon our consciousness. But ideas are not received through these alone. The mind, by its innate powers, profiting by what it already knows, evolves new thoughts, new ideas. Nor is this all. Our minds are the receptacles of impressions stamped directly upon them by the Spirit of the Great Supreme, independently of the senses, and also of their own cognitions.

One has said that "mental philosophy has for its object to ascertain the facts and laws of mental operation." The mind is not in parts, it is one. "For this," says Leibnitz, "there is no necessity that there should be different parts in the soul, as it is not necessary that there should be different parts in the point on which various angles rest." Aristotle is represented as remarking, "But it is necessary that that which judges should be one and the same, and that should even apprehend by the same the objects which are judged." And Addison is thus quoted by Stewart: "Although we divide the whole soul into several powers and faculties, there is no such division in the soul itself, since it is the *whole soul* that remembers, understands, wills, or imagines. Our manner of considering the memory, understanding, will, imagination, and the like faculties, is for the better enabling us to express ourselves on such abstracted subjects of speculation, not that there is any such division in the soul itself." Again he says, "What we call the faculties of the soul are only the different ways or modes in which the soul can exert itself."

The late Joseph Haven, D. D., formerly a professor in Amherst College, defines a faculty of the mind to be "simply the mind's power of acting, of doing something, of putting forth some energy and performing some operation." He claims that "the mind has as many distinct faculties as it has distinct powers of action, distinct functions, distinct modes and spheres of activity. As its capabilities of action and operation differ, so its faculties differ." He holds, as before expressed, that the mind is not complex, nor divided, but one in all its acts, which varied acts indicate its varied powers, called faculties. And Sir William Hamilton says: "A *faculty* is nothing more than a general term for the causality the mind has of originating a certain class of energies; a *capacity*, only a general term for the susceptibility the mind has of

being affected by a particular kind of emotions. All mental powers are thus, in short, nothing more than names determined by the various orders of mental phenomena." Again he says, "The end of philosophy is the detection of unity." And again, "The faculties are special modifications under which consciousness is manifested."

Such, in brief, are some of the views held by several writers on mental science, relative to the oneness or unity of the mind itself, and the nature of what are called the faculties of the mind. Not altogether unlike these in the human being, is the mind with its manifestations in domestic animals, as shown by the animals themselves. But here I am met by contrary views. Mr. Hubbard Winslow, whose text-book on mental philosophy is well known, advances the idea that animals have no reason, but only instinct; that reason and instinct are set off against each other in the animal and human races; that man has rational powers to guide him, while animals have those of instinct. He traces some of the differences between reason and instinct, thus: "1. Instinct is mature at once; reason matures gradually. 2. Instinct is a blind impulse; reason is a reflective power. 3. Instinct is *limited;* reason is universal. Indeed, that the entire range of instinct embraces only four objects,—*nutrition*, *protection*, *motion*, *propagation*"; while "reason, on the contrary, is applied in all directions, and embraces all subjects."

Now, I contend, that however correct the foregoing definitions of the two words may be, and however true it is that all that is accorded to man is properly done, full justice is not meted out to the mere animal tribes. This author does indeed hold that man has something in him in the nature of "instinct," and I shall endeavor to show, as intimated, that, on the other hand, the animal creation possess elements of nature which, in character, if not in number or degree, answer to *some*, at least, of what are styled faculties of the human mind.

Professor Haven, before referred to, in his work on mental science, advances views quite similar to those of the last-named writer. While on the subject of "instinct," he at first admits the idea of intelligence of some kind in brutes, as well as in the human species. He says, "How far the two resemble each other, and how far they differ, it is not easy to

determine, not easy to draw the dividing line, and say where the brute intelligence stops and human intelligence begins." And yet he afterwards denies to animals intelligence in the true acceptation of the term. He claims that many of the acts of animals and insects develop even greater skill than can be seen in man, and yet he contends that they do not perform them by the light of intelligence. He maintains that instinct is a law of action put into the animal at its creation, which works in him, not by reason or reflection, but by a blind impulse; that bird or bee does nothing by the force of education or progress in knowledge; that the one builds her hive alone, and at first, as well as ever she will afterwards, and the other her nest the same. The intelligence is not that of the creature, he says, but of the Creator, and that it is given as a law of the animal's being, by which he blindly acts.

This author raises the question as to whether the differences between man and the brute are those of *kind* or *degree*. After some discussion of the question, he arrives at the conclusion that the intelligence of the brute differs in *kind*, and not in *degree* merely, from that of man. The use of the word "*merely*" seems to be quite an admission; and yet he labors to show that the beast does not possess any of the higher faculties, but only those of sense.

He begins his detail of denials by saying that the brute is not "a moral and religious being." With this I presume we all agree. For to be a moral and religious being one must be a moral agent, which neither domestic animals nor any others of the lower species are supposed to be. Says the late Rev. Richard Watson, of England, one of the most profound writers, "He is a moral agent who is capable of moral actions; and an action is rendered moral by two circumstances—that it is voluntary, and that it has respect to some *rule* which determines it to be good or evil." And Sir William Hamilton tells us "wherein the moral agency of man consists. Man is a moral agent only as he is accountable for his actions; in other words, as he is the object of praise or blame; and this he is only inasmuch as he has prescribed to him a rule of duty, and as he is able to act, or not to act, in conformity with its precepts." And thus we say, that while on the one hand a law, or rule, has been made known to man, and power

and liberty to act under it given, the mere animals in question, on the other hand, having no such revelation, that we know of, cannot be supposed to have moral faculties, which would imply moral accountability, and the awards of approval for obedience, and condemnation for sin, or disobedience.

There is another thing these animals do not possess, and the lack of which does not seem to be computed by these writers, and that is the power of speech. Did they have this, it would be much easier for those who now merely theorize upon the subject, to tell *how much* real intelligence these creatures possess. Some of them do almost talk, and so far as we can understand their language, indicate much more of real intelligence than the two writers from whose opinions we dissent concede to them.

Without pretending to follow the most approved order in the arrangement (and I find others differ as to this), I will here name some of the more prominent manifestations or activities of the human mind denominated faculties. Take the following: perception, conception, imagination, reason or the reasoning power, reflection, memory, judgment, will (which includes desire), attention (accompanied by meditation), intuition. I will begin with the last named.

One has said that "reason is instinct in man." At this I demur. But it is admitted, I think, on all hands, that man has something in his mechanism properly called instinct, although it is said to be in some respects weak. And yet in the craving for food by the child, and in that which tells him how to obtain it, it is certainly quite apparent. But I would say that that faculty of our mind which bears the greatest resemblance to instinct in the animal is intuition. Intuition, or the intuitive power, is that which calls into use first presentations and primary ideas. It is the first thought or principle which the mind grasps without reflection or reasoning of any kind. And, as an intellectual element, does it not answer to "instinct" in the mere animal, taking Professor Haven's definition for our guide? He maintains that instinct is a law of action in the brute, which comes to him without reflection, without his own agency, and yet that it is that upon which he acts. So we, after receiving them, act upon our own intuitions. But I must just here take exception

to another of his positions, which I can but regard as an unwarranted assumption; namely, that the brute does not "*think*" in the proper acceptation of that term. Taking the expression, as he evidently meant it, to comprehend all dumb animals—domestic ones included—I would ask how the ox would ever come to his fodder, the bee construct her hive, or the bird build her nest, without *thinking* of the object aimed at?

The five senses are all possessed by the *mere* animal, as we denominate him. These, by means of nerves, as in man, communicate with the brain, the seat of mental activities, and thus the animal makes up judgment as to his own course of action to be pursued, and often, also, as to what will be that of others. If he sees danger, he will avoid it. If he tastes food which he does not like, he will reject it. He manifests his pleasure or displeasure at the different sounds he hears, accordingly as they are agreeable or disagreeable to him. So of the other senses. His brain, although relatively small, compared with that of man, is subject to all this variety of impressions, as the seat of consciousness. Does he not, then, *think*, in the proper acceptation of the term?

Let us take some actually known facts as demonstrating the existence of faculties in animals, corresponding in nature to some of those enjoyed by men. They are indeed abundant, but we can here present only a few. Some years since lived a friend of mine in the town of Nantucket, who kept a cow. The animal was much of the time in a small lot inclosed by a high board fence, the outlet being a gate with a large wooden latch. Just under the latch was a hole through the board in the door, so that a person on the opposite side could put a finger through and raise the latch. Outside of the lot was good grazing. That cow, having had access there, learned the art of putting one of her horns through that finger-hole and raising the latch, and of thus making her egress to the place of feeding. Finally, after trying other means to break up this habit of the animal, the owner closed up the aperture. The cow, not to be outwitted, then accomplished her object by putting her horns under the gate and raising it from its hinges. Now, are there not manifest in the conduct of that cow, first, *perception?* she perceived the way in which her

owner passed; secondly, *conception?* she conceived her plan of operation; thirdly, *will?* she willed to put her plan in execution; fourthly, when she had done it once, her *memory* was brought into requisition, and she remembered how to do it again; and fifthly, when foiled in her first method of accomplishing her object, her *imagination*, or, perhaps, we should better say her *inventive genius*, was put to the test, and she attained it in another way. Professor Haven insists that the brute never learns anything; he is mature at birth. A chicken is a hen when first hatched; the spider spins her lines, the bird builds her nest, the bee constructs her cells, the beaver his dam, and the ant its subterranean arch just as well the first time as ever afterwards. But did not that cow progress somewhat in knowledge after she was a calf? And does not the ox learn to follow the cartway and the furrow, and to obey his owner or driver?

Take the everywhere-known examples of the horse. He shies the place where he has been affrighted or injured; he plays the "old soldier" with a timid or inexperienced driver (as I have occasion to recollect), knowing he is not his master. In these he shows both *memory* and *reason*. He remembers the scene of danger, and his reason teaches him to avoid it. And also in the latter case he *knows* he need not go fast unless he is pleased to do so, and he *wills* that he will not. Then, too, the too-heavily loaded animal, either ox or horse. He tries to take the load along, at the bidding and whip of his "taskmaster," and failing tries again and again, by turns turning his head and trying to make his driver understand that the load is too large, using every persuasive in his power, and would speak if he could, while his *less rational* master persists.

Take an illustration from the lamb. It may be a sheep when born, and would ordinarily keep with the wild sheep; but let the parent sheep die, and some matron or maiden of the household take the little bleater to the door-yard, and nurse and feed it: does it not learn something which it did not know at first about the manner of life and the voice and ways of its friend and protector? And why did a certain cat I once knew take her kittens away up behind a chimney and beyond the ceiling, where no mortal could reach them, and

keep them there till they were quite large, if it were not to prevent their being dealt by as other kittens had been? Call that instinct, if you please. That was present; but were there not manifest, also, both *reason* and *will?* Another, the property of my nearest neighbor, found a comfortable home with us from winter to winter, while, her house being closed, the good lady was making her annual visit with her friends in Boston. After a year or two, "black-nose," who was in the interim neighborly, became, in some way, so cognizant of the near approach of the time at which her mistress was to leave, that she would come of her own accord and take up her abode with us a little in advance of the event. Were there not in the act, evidences of a retentive memory, and of keen powers of observation?

The late Hon. Thomas Bradley, of Vineyard Haven, was aroused from his slumbers in the night, by the intense scratching and other boisterous noises of his cat at his lodging-room door. At first he did not heed it, but the persistent noise of the cat induced him to arise and open the door, when he was met by a volume of smoke. He rushed down stairs and found the woodwork in his sitting-room ablaze. He was just in time to save his house from entire conflagration. What intelligence less than human prompted that act in the cat?

But of all animals, perhaps there is none which illustrates our position so well as the dog. The other domestic animals named evidently understand many of our words, having *learned* to understand them. This animal would seem to be more intelligent and more tractable than they. A highly respectable gentleman, who lived near me, now deceased, had some years since a dog which he had petted and set by, but which had become old and undesirable in the house, and he said to his family one day in the hearing of the animal, "I shall have to get some one to shoot this dog." "Bose" immediately went out of the house, and never returned. Did not that dog understand the full import of the words of his master, and did he not *reason*, and base his conduct upon that understanding and that process of reasoning, with a view to the saving of his own life? Another man, my neighbor, from whom I have the story direct, living in town, and owning a wood-lot near, was accustomed to cut the wood in

the forest, and to employ another man living about a third of a mile off, to cart it. The dog, as other dogs do, usually accompanied his owner in those walks. Having occasion one morning to have some wood carted, but being called another way, and thus unable to go and inform the other man of his wants, he spoke of the matter and of his regrets in the case, the dog being within hearing. He went to his day's work, but what was his surprise when he came home to his dinner, at noon, to find his load of wood tipped down in his yard. The wife knew that Mr. R—— brought it. On inquiry, his friend reported that the dog came up to his barn, to the stable where his horse was, then went out around his truck-wagon, repeating these movements, and apparently intent on making him understand what was wanted, insomuch that he harnessed in his horse, and went to the woods and brought the load. How could a human being have done the errand more intelligently, except to utter the words of his master, which the dog understood, but could not express.

Another gentleman in the town where I reside now, has a dog that at the bidding of his master will place either one or both of his fore-paws, as told to do, upon his master's knee, or stand erect upon his hind-feet, and perform various other feats. When one of the family sits at the piano-forte and plays, he often comes in and takes a position in front of it, and makes a noise evidently the nearest he can to that of singing. Is there no exercise of *mental faculties* such as we possess in all that? Is there no understanding of *language?*

One of the mental faculties is called by writers "*attention*," which is the power to concentrate and continue thought upon a single subject or object for a long time. This is sometimes evinced by long-continued action for the accomplishing of a specific purpose. We have in history some very remarkable instances of this kind,—such as that of Socrates while accompanying Alcibiades in a military expedition; that of Archimedes at the storming of Syracuse; that of Joseph Scaliger while a Protestant student in Paris at the time of the St. Bartholomew massacre; and that of Napoleon Bonaparte, who, when at the military school in Paris, having a very difficult problem given him for solution, shut himself up seventy-two consecutive hours, and mastered it. We have something of

this kind in the dog that will dig the earth for hours together to secure a musk-rat which he knows to be there, far up in his recess, or watch for a long time an article left in his charge, and even long days and nights, the living cripple or the dead remains of his cherished master or mistress.

A reliable gentleman of my acquaintance, when at the age of eight years, lived in the town of Chilmark. One day, during a blinding snow-storm, having occasion to go some rods from the house, on attempting to return, he could not see it, and knew not which way to go; but starting in the direction which he thought was right, the little Spanish house-dog soon appeared and caught him by his clothes, and urged him in the opposite direction, which proved to be the right one, the dog ever and anon pressing down the snow, then quite deep, to make him a path. The other course was a dangerous one, and, but for the dog, he would in all probability have perished. What, perhaps, is the most remarkable feature of the story, was, that the animal, being in the house when the little boy went out, seemed presently to become alarmed, went to the door, jumped up to the latch, and made every possible demonstration of his anxiety to get out, and on being let out by one of the inmates, sprung away to the rescue of his young friend.

I refer, not to uncertain stories, but to authentic accounts. And I presume every one present knows facts similar to those I have given. But I must relate one more. A near relative of mine recently lost a lovely daughter, who had wasted away by consumption. He has a large dog. When, at the funeral, the casket containing the remains was carried out to the hearse, the dog followed out and went under the hearse, moaning; and, accompanying the procession, when the box was let down into the grave the animal went up to the open grave, pawing the sand near it and making a mournful noise. Call that "instinct" if you will, but how could an act be more expressive of intelligence such as is in man, or how could human grief be more *reasonably* shown? Instances might be multiplied; but my limits will not allow of this. It must be apparent, that, with the exception of the moral and religious faculties in man, such as hold him to a high accountability, and any marked resemblance to which we do not claim for

even domestic animals, these do possess many of the attributes of mind corresponding to those enjoyed and exercised by members of the human race. In what degree, we will not pretend to say. But had such animals the power of speech, I doubt not they would quite astonish us by the exhibition of those faculties in a degree of which we do not now even dream; and thus showing that their likeness to the human, in addition to other considerations, entitles them to humane treatment and the protection of the law.

HEBRON VINCENT.

The report was accepted.

Prof. GOESSMANN then submitted his

THIRD ANNUAL REPORT ON FERTILIZERS.

To the State Board of Agriculture.

GENTLEMEN:—The history of the fertilizer trade during the past year presents many features of general interest.

Much progress has been made towards the adoption of a more satisfactory basis for the sale of fertilizers. The proposition for selling the latter by chemical analysis, with guarantee of a stated definite composition, has met with general indorsement. The propriety of distinguishing between the commercial and the agricultural value of a fertilizing material, is well recognized as a naturally satisfactory basis for business transactions between manufacturer and farmer.

The former begins to realize that the fertilizer law does not make his position an exceptional one; for he enjoys in the general market the full benefit of his personal business resources; he feels encouraged in making improvements in the production of his article, because its true merits are rendered more conspicuous by a comparative analytical statement, which the law requires, regarding the chemical composition and the general character of the various fertilizers offered for sale. As the comparative cheapness of the different brands of so-called standard fertilizers will be decided in the future, not by their respective price per ton, but more generally, as it ought to be, by their relative amount and the peculiar condition of the phosphoric acid, potassium oxide

and nitrogen, he knows that his commercial success will depend in a controlling degree on the readiness with which he satisfies the special wants of the farmer. The latter does not fail to notice that the chances for securing his fertilizers at their real market prices are greatly improved.

A commendable exertion could be noticed on the part of many manufacturers to improve their fertilizers. The price of many leading brands has been reduced from 20 to 25 per cent. as compared with previous years. This reduction has been so general, that a change in the valuation of the fertilizer becomes quite justifiable. In adopting a new scale for a comparative valuation of the fertilizers which have been tested during the past year, I have stated, for obvious reasons, such figures as will be conceded by dealers to be liberal.*

	1874-75. Per Pound.	1875-76. Per Pound.
Soluble phosphoric acid,	16.25 cts.	12.5 cts.
Reduced,	13 "	10 "
Insoluble phos. acid in mineral phosphates,	5 "	4 "
" " in bones, fish and animal dust,	6 "	6 "
Nitrogen,	30 "	25 "
Potassium oxide in muriate,	8 "	6 "
" " in sulphate,	8 "	8 "

When advocating for the first time, in a report (January, 1873) to the trustees of the Massachusetts Agricultural College, the adoption of certain regulations regarding the sale of commercial fertilizers, I felt quite confident that a judicious supervision of the fertilizer trade, accompanied by a proper periodical official discussion of the mutual interests of the manufacturers of fertilizers and the farming community, would furnish a very efficient means to communicate to the former the particular wants of the latter; whilst at the same time a suitable chance would present itself to engage the attention of a large class of practical farmers for the exposition of rational principles of agriculture by practical illustration touching their pecuniary interest, who quite frequently would not feel disposed to listen to an abstract enumeration of the principles which control the success of their industry. It is gratifying

* See price-list at the end of report.

to feel entitled to state at this early date, judging from numerous communications received, and from the character of the questions proposed, that the fertilizer law promises to prove a valuable instrument for the promotion of agricultural education among that class of farmers in particular, who, on account of their practical engagements, are beyond the direct influence of our agricultural educational institutions and scientific agricultural literature.

Encouraged by your kind indulgence on former occasions, I take the liberty to present within the following pages,—besides the results of a large number of actual analyses of fertilizers offered for sale,—some statements regarding the condition of our important home resources of substances used for the manufacture of concentrated commercial fertilizers.

I.—Potash Salts.

The German potash salts are already a recognized prominent feature in our fertilizer trade.

The consumption of these compounds in our agricultural industry has again been much larger during the past season than during the preceding one.

The supply of the lower grades—natural and artificial kainit—has been apparently equal to the demand; whilst that of the higher grades, sulphate of potassa in particular, although imported in much larger quantity than during the previous year, became exhausted at a comparatively early date.

The following chemical analyses give a fair representation of the articles met with of late in our markets. The samples were taken from various lots extensively sold by Boston and New York dealers:

Muriate of Potash.

	Found.		Represented.	
	I.	II.	I.	II.
Potassium oxide,	52.44	53.07	53.0	52–53
Sodium oxide,	–	5.30	–	–
Calcium oxide (lime),	–	trace.	–	–
Magnesium oxide,	–	0.30	–	–
Insoluble matter (in water),	0.80	0.25	–	–
Moisture,	3.00	–	–	–

The composition of both samples corresponded well with their represented percentage of potassium oxide.

Their main constituents were chloride of potassium from 83 to 84 per cent.; and chloride of sodium or common salt from 10 to 12 per cent.

The ton of 2,000 pounds, sold in small lots at 60 dollars currency, which amounts to 5.8 cents per pound of potassium oxide.

This high grade muriate of potash is one of the cheapest potash sources we have at present at our disposal.

ARTIFICIAL KAINIT.

	Found.		Represented.	
	I.	II.	I.	II.
Potassium oxide,	12.78	14.50	11.3-13.0	16.20
Sodium oxide,	14.42	18.10	–	–
Calcium oxide (lime),	5.07	–	–	–
Magnesium oxide,	9.66	7.57	–	–
Sulphuric acid,	16.99	15.90	–	–
Insoluble matter,	–	1.95	–	–
Moisture,	3.80	–	–	–

The analytical results of sample No. I. confirm the amount of potassium oxide represented, whilst in sample No. II. there is a deficiency of from one to two per cent. of that substance.

The difference between the actual amount noticed and the one represented, is, however, so small, that variations in moisture may account for the result.

Dealers in fertilizers *ought to state the guaranteed composition with reference to the particular percentage of moisture to which the statement applies.*

Farmers do well to insist on specifications of this kind; for it is the only safe way to secure a mutually satisfactory understanding in case of complaints.

A careful consideration of the various constituents of the above compounds and their mutual chemical relations to each other leaves no doubt about the fact that the potassium is here present in two different forms; namely, as potassium sulphate and as potassium chloride.

No. I. is a low grade of its kind; No. II. a medium quality; they sold in the market, respectively, at $20 and $25 per ton of 2,000 pounds.

The pound of potassium oxide costs, therefore, from eight to nine cents. Some reasonable allowance for the agricultural value of the remaining constituents of the kainit renders its cost fair, when compared with that of the muriate of potash.

SULPHATE OF POTASSA.

	Found.		Represented.	
	I.	II.	I.	II.
Potassium oxide,	20.44	44.39	21.60	44–45
Sodium oxide,	5.36	3.29	–	–
Magnesium oxide,	2.63	trace.	–	–
Calcium oxide (lime),	–	trace.	–	–
Sulphuric acid,	10.86	43.52	–	–
Insoluble matter (in water),	31.55	not det.	–	–
Sand, oxide of iron, etc.,	–	3.60	–	–

Both samples are evidently refuse material from another branch of industry than that carried on at the Stassfurt mines. No. I. was sold by a dealer in Boston, the other by a dealer in New York; in case of No. I., but part of the potassium oxide is present as sulphate; in No. II. there is a small excess of sulphuric acid. The saline mass, in this case, had a decided acid reaction, yet not sufficient to cause any injury to plants, as long as the rule, which applies to all concentrated fertilizers, the salines in particular, is adhered to; namely, to mix them with at least three or four times their weight of soil before sowing them broadcast.

There is one feature, however, which deserves the serious attention of farmers when using potash salts, like the above ones, which contain none, or but a small percentage of either chloride of sodium or sulphate of magnesia; for it requires in the latter cases a longer period of time to diffuse the potassa through the entire body of the soil, which serves in the production of our various crops.

Those plants which root mainly within the surface portion of the cultivated soil, will be benefited sooner than the deep-rooting ones. Root crops and leguminous plants, as clover,

will show in the majority of cases but little effect during the first season of their application.

Chloride of sodium and sulphate of magnesia are known to increase in an unusual degree the distribution of the potassa.

Either one or the other, or frequently both compounds, are present in all of the most reputed brands of Stassfurt potash fertilizers.

Their presence controls their action as far as time is concerned, and imparts to them in most instances a higher peculiar agricultural value as compared with the two last-noted samples.

Besides the previously described different qualities of potash salts, there have been also offered for sale two other articles, which were represented to contain from 33 to 35 per cent., and from 50 to 52 per cent., of sulphate of potassa. The former was offered for sale by a New York dealer, the latter by a firm in Boston.

Complaints of several importers, regarding a loose management on the part of commercial agents at the German ports, Bremen and Hamburg, have been not infrequent during the past year.

Whatever importance may be attached to this impression, there is apparently no better step advisable for our extensive dealers in potash fertilizers, than to open direct communication and business transactions with reliable and responsible manufactories at the potash mines in Germany.

Judging by the frequent applications received from fertilizer dealers in all parts of the country, it is but reasonable to expect for the coming season a more thorough organization of our home interests, regarding a suitable supply sufficient to meet our steadily increasing demand.

Nothing in my opinion seems to favor more the realization of these desirable results, than to confine ourselves as much as possible to the importation and the consumption of only a few of the most desirable standard articles.

Both first cost and special adaptation to our agricultural industry ought to be carefully considered, when contemplating measures which need the support of dealers and consumers, to work mutually satisfactorily.

For reasons already explained in detail in my last year's

report (II.), I have recommended to all who have asked my opinion, concerning the qualities of German potash salts, which are most desirable for our special agricultural interests, to confine themselves mainly to the importation of the three following grades :—

(1.) *Muriate of potash*, containing from 80 to 84 per cent. of that compound, which is equal to from 50 to 52 per cent. of potassium oxide.

(2.) *Sulphate of potassa*, containing from 52 to 56 per cent. of that compound, which is equal to from 28 to 29 per cent. of potassium oxide; it also contains usually from 30 to 35 per cent. sulphate of magnesia, equal to from 10 to 12 per cent. of magnesium oxide.

(3.) *High grade artificial kainit*, containing from 30 to 32 per cent. of sulphate of potassa, which is equal to from 14.5 to 17.3 per cent. of potassium oxide. The remaining constituents of this class of kainits, consist usually in the main of from 35 to 45 per cent. of chloride of sodium (common salt), and from 8 to 12 per cent. of sulphate of magnesia, with but a small per cent. of chloride of magnesia, on account of a previous calcination.

The importation of lower grades of these compounds needs apparently no farther encouragement, because the demand has been supplied thus far satisfactorily and in ample quantities by the genuine Leopoldshall natural kainit, which is sold at Baltimore, New York and Boston, by its sole agent for the United States, W. Dunan, Esq., of Baltimore.

As every additional development of the almost inexhaustible resources of potash fertilizers at Stassfurt will sooner or later affect our home trade in that commodity, it may not be without some interest here to relate shortly some changes which of late have taken place in that locality and its vicinity in Germany.

Until quite recently the mining of the salines, which serve for the production of the potash fertilizers in Germany has been conducted by the governments of Prussia and the duchy of Anhalt-Saxony. The products of their mining operations at Stassfurt and Leopoldshall have been sold to private parties, who turned them, at their own wish, into articles of a more definite character, and of a higher commercial value.

The unusual importance of this new industry created quite naturally a lively spirit of speculation on the part of capitalists, which manifested itself at first by the formation of large stock companies for the erection of factories to convert the crude material into salable potash compounds.

The number of factories increased from 1861, when the first one was built by Dr. Frank, to thirty-three in 1872.

The consumption of the crude salines, which, in 1862, amounted to 20,400 tons, rose within an interval of ten years to not less than 514,200 tons.

Of late, some successful attempts have been made by private parties to open new mining shafts independent of government control.

The most successful enterprise in this direction promises to engage our attention within the coming season, on account of the reported establishment of a direct agency in New York City on the part of the owners of the mines and their complement of factories.

The products of these new works will be introduced to us as the Douglashall mining products, muriate and sulphate of potash, etc., of Western-Egeln, Germany.

Western-Egeln is a small Prussian village about nine or ten miles to the north-west from Stassfurt.

The chief manager of the enterprise, Mr. Douglas, is a former reputed Stassfurt potash manufacturer; the natural resources at his command are stated as superior compared with those at Stassfurt and Leopoldshall.

F. Bishof, one of the foremost investigators and scientific exponents of the extent and the nature of the peculiar local geological formation, known as the Stassfurt salt deposit, states, in a recent semi-official report, that the crude salines at Egeln average 18 per cent. of muriate of potash (the average at Stassfurt is stated to be about 17 per cent.); and that in regard to quantity, the Douglas mines fully equal the old ones.

During a late visit, at my office, of one of the gentlemen connected with the agency of the Douglashall mines established at New York, I learned that the following brands will be introduced at an early date into our fertilizer market:—

Douglas Potash Fertilizer, No. I.—It is a sulphate of potassa of 95 to 99 per cent., equal to from 51.4 to 53.5 per cent. of potassium oxide.

Douglas Potash Fertilizer, No. II.—It is a muriate of potash, which differs from most articles of that name; for it contains besides from 70 to 75 per cent. of chloride of potassium, from 20 to 25 per cent. of sulphate of magnesia.

These valuable articles, it is stated, will be sold with a full guarantee of their represented composition, and at prices which I do not doubt will secure a good patronage.

The plan, carried out as mentioned, cannot do otherwise than exert a beneficial influence on the present condition of the entire trade in potash fertilizers.

Crude Carnallite.

This substance represents the main bulk of the raw material which serves for the manufacture of the German concentrated potash salts.

A handsome specimen of a superior quality of crude carnallite from the Douglashall mines, which has been kindly presented to me, gave, on a careful examination, the subsequent analytical results:—

Potassium oxide,	13.68
Sodium oxide,	7.66
Magnesium oxide,	13.19
Calcium oxide (lime),	none.
Sesquioxide of iron,	0.04
Chlorine,	41.56
Sulphuric acid,	0.56

The saline mass consisted, therefore, mainly of,—

Chloride of potassium,	21.65 per cent.
" of magnesium,	30.66 " "
" of sodium,	13.89 " "
Sulphate of magnesia,	0.84 " "

and contained thus 80 to 81 per cent. of genuine carnallite. The average of the crude carnallite at present sold to the factories is stated to contain but 66 per cent. of that compound.

Ashes of the Hulls of Cotton-Seed.

Potassium oxide,	23.72
Phosphoric acid,	7.88
Calcium oxide (lime),	5.60
Magnesia,	4.43
Insoluble matter,	7.10
Moisture,	26.81
Carbonic acid, oxide of iron, etc.,	–

The sample of ashes which furnished the material for the above-stated analytical results, was sent me by a farmer in our vicinity, with the request to give my opinion in regard to its commercial value. My analytical results do not correspond with those published by good authority with reference to the composition of the ashes of the hulls of cotton-seed.

Prof. H. C. White, of Georgia, who has given us during the past year a valuable report "On the complete analysis of the cotton-plant," states that the ashes of the hulls of the cotton-seed contained 14 per cent. of potassium oxide, and 7 per cent. of phosphoric acid. My results correspond more closely with those obtained from the ash of the roots of that plant.

The commercial value of ashes of the above-stated composition, would be, in the retail trade with us, from $40 to $42 per ton of 2,000 pounds, allowing five cents per pound of phosphoric acid and eight cents per pound of potassium oxide.

Fertilizer dealers, as a rule, do not yet furnish for less money the constituents of the ash, phosphoric acid and potash in particular, in an equally valuable form.

The farmer who buys this ash as a special fertilizer for his fields, shows better judgment than the one who sends it habitually into the general market, as a product of his special agricultural industry, without feeling sure that he can replace in a more economical way its main constituents.

The waste material of any farm crop, as a general rule, pays best when turned to account upon the same field which served for its production.

This is still more true in case of industrial crops, where a frequent reproduction of the same crop becomes a leading feature of the entire farm management.

Peruvian Guano.

The samples of Peruvian guano which have been subjected to an examination during the past year, were taken at different periods of the season, and in different sections of the State. Nos. I. and II. were offered for sale in the month of April by dealers in Boston, and Nos. III. and IV. in June by parties in Worcester.

Raw Peruvian Guano.

	I.	II.
Phosphoric acid,	16.40	16.39
Nitrogen,	9.52	9.39
Potassium oxide,	2.38	2.32
Insoluble matter (sand, etc.),	1.60	2.20

The analytical results prove that both specimens are of a good quality, and apparently from one and the same cargo—Guanape guano.

	No. I. Valuation.
328.0 pounds of phosphoric acid,	$32 80 per ton.
190.4 " of nitrogen,	47 60 " "
47.6 " of potassium oxide,	3 80 " "
Total,	$84 20 " "

	No. II. Valua ion.
327.8 pounds ot phosphoric acid,	$32 78 per ton.
187.8 " of nitrogen,	46 95 " "
46.4 " of potassium oxide,	3 71 " "
Total,	$83 44 " "

	III.	IV.
Total phosphoric acid,	15.50	16.40
Nitrogen,	5.22	5.61
Potassium oxide,	1.60	1.75
Insoluble matter (sand, etc.),	7.64	9.20

	No. III. Valuation.
310.0 pounds of phosphoric acid,	$31 00 per ton.
104.4 " of nitrogen,	26 00 " "
32.0 " of potassium oxide,	2 56 " "
Total,	$59 56 " "

	No. IV. Valuation.
328.0 pounds of phosphoric acid,	$32 80 per ton.
112.2 " of nitrogen,	28 05 " "
35.0 " of potassium oxide,	2 80 " "
Total,	$63 65 " "

The samples Nos. III. and IV. contain about 4 per cent. of nitrogen less than the preceding ones (I. and II.); they differ, consequently, in regard to their commercial value, from $20 to $24 per ton from the former.

The frequent occurrence of similar results, in reference to the chemical composition of the raw Peruvian guano in many other countries, has been stated on a former occasion.

In my last report I discussed, as I believe with fairness, the unsatisfactory condition of our trade regarding this reputed standard fertilizer; pointing out at the same time some of the means, by which the just wishes of the farming community might be satisfied.

It is gratifying to be able to state here, that during the past year quite important changes have been inaugurated, on the part of the consignees of the Peruvian government for the United States,—Messrs. Hobson, Hurtado & Co., of New York City,—which promise, if intelligently carried out as far as practicable, to meet better the requirements of rational agriculture, and to reëstablish on a firmer basis the claim of the Peruvian guano as being the leading standard fertilizer, in regard to the ammoniated phosphates. In consequence of these changes, there will be the following distinction henceforth in our guano trade:—

A. *Raw genuine Peruvian guano;* and
B. *Rectified genuine Peruvian guano.*

Both kinds will be sold at the general office in New York, and, through agents, I presume elsewhere.

A.—Raw Genuine Peruvian Guano.

The price of this article, which refers to the crude imported fertilizer, will be, until further notice is given, $60 currency per ton of 2,240 pounds gross weight, with a guarantee of 8.24 per cent. of nitrogen, or 10 per cent. of actual and potential ammonia.

I am informed that the consignees intend to raise the value of all inferior guanos, by mixing them with superior ones, before they enter our market.

The following circular, which has been issued during the past season, for the information of dealers, gives some definite notion regarding the rate of discount given to the trade.

New York, May 1, 1875.

Sirs:—We beg to inform you, that until farther notice is given, Peruvian guano will be sold at the following prices, in currency per ton of 2,240 pounds, gross weight, *at the time of delivery:*—

From	10	tons	to	25	tons,	at	.	.	.	.	.	$60 00 per ton.
"	25	"	"	50	"		.	.	.	.	.	59 50 "
"	50	"	"	75	"		.	.	.	.	.	59 00 "
"	75	"	"	100	"		.	.	.	.	.	58 50 "
"	100	"	"	150	"		.	.	.	.	.	58 00 "
"	150	"	"	200	"		.	.	.	.	.	57 50 "
"	200	"	"	275	"		.	.	.	.	.	57 00 "

From	275 tons	to 350 tons, at	$56 50	per	ton.
"	350 "	450 "	56 25	"	
"	450 "	575 "	56 00	"	
"	575 "	700 "	55 75	"	
"	700 "	850 "	55 50	"	
"	850 "	1,000 "	55 25	"	
For	1,000 tons,	. . . . .	55 00	"	

The same return will be made to purchasers at the end of the season (that is to say, in June and December) on the quantity purchased by each party during the preceding six months, as if the entire amount bought had been taken at one and the same time.

Trusting that so great a reduction in the price of guano, and the advantageous terms upon which it is now offered for sale, will enable you to increase your orders,

We remain, etc., etc.,

HOBSON, HURTADO & Co.

To sell raw Peruvian guano, with *a guarantee* of 10 per cent. of ammonia, or 8.24 per cent. of nitrogen, and from 15 to 16 per cent. of phosphoric acid, at the above price, would make it again one of the cheapest and best imported fertilizers.

B.—Rectified Genuine Peruvian Guano.

A still more important change in our fertilizer trade, however, is the introduction of the *rectified Peruvian guano*, which is essentially the same article spoken of in my last report as the soluble Peruvian guano of Ohlendorff & Co., of Hamburg, Germany.

A few facts regarding the origin of this new fertilizer may serve as an introduction to the subsequent discussions concerning the rectified Peruvian guano of Messrs. Hobson, Hurtado & Co., of New York City.

The Peruvian guano was noticed, for several years after its first introduction into the markets of Europe (1840 to 1845), to be of a quite uniform quality; in the course of time, however, variations in composition became more frequent. Admixtures of stones, pieces of granite from the underlying rocks, and sand from beach washings, pointing towards an exhaustion of some of the guano deposits then worked,

increased to such an extent at times, as to seriously depreciate the commercial value of the material. On the other hand, not unfrequently, entire cargoes, or parts of them, became damaged by sea-water. Both circumstances worked towards the same end; they furnished, although screening and drying as far as practicable had been resorted to, the trade with inferior qualities of genuine Peruvian guano. To save the reputation of their business, the agents of the Peruvian Government, in Germany (Messrs. G. D. Mutzenbach & Sons), were induced in 1864, to cease selling these inferior guanos at a general auction to the highest bidder, which had been their previous mode of disposing of them, for it offered unusual chances for fraudulent practices, and affected thereby seriously their interests.

These guanos were, henceforth, only to be sold at lower rates, with a full statement of their character, either directly to farmers or to those dealers, who had no privilege to sell the genuine Peruvian guano; they served in the latter case usually as stock for the manufacture of artificial fertilizers of various descriptions.

Messrs. Ohlendorff & Co., of Hamburg, who at this stage in the history of the guano trade were largely engaged in drying the guanos damaged by sea-water, decided to adopt the course recommended to them by Dr. Meyn and other agricultural chemists; namely, to treat the damaged material with sulphuric acid, and to produce thereby an efficient new fertilizer.

The results of their experiments were subsequently introduced to the farmers of Germany by the name of *Ohlendorff's soluble Peruvian guano.*

The process of its manufacture, as at first carried out, may be described as follows: the moist Peruvian guano is dried at from 75° to 100° (Centigrade) in suitable stoves, and the dried mass, after grinding and screening, treated, in large cemented brick tanks, with concentrated sulphuric acid (66° B.), taking for every one hundred pounds of Peruvian guano, from twenty to twenty-two pounds of the acid.

The well-mixed mass was subsequently discharged upon a tight floor to dry; and after weeks of curing, ground into a fine powder, to allow a uniform distribution within the soil.

The main reactions of the sulphuric acid consist in the following:—

(a.) The free ammonia and the volatile ammonia compounds are changed into non-volatile sulphate of ammonia. The active ammonia is also somewhat increased at the expense of the urates, etc.

(b.) The insoluble bone phosphate is turned into a soluble phosphate; and

(c.) The chlorides present are changed into sulphates.

The new fertilizer, in consequence of the good care bestowed upon its manufacture, met with unusual favor. As soon as the damaged articles were disposed of, genuine good guanos were subjected to the same treatment.

The changeable character of the Guanape and other kinds of guanos, which at that period began to take the place of the reputed Chincha Islands guano of an earlier date, rendered this proceeding still more judicious.

The annual consumption of the soluble Peruvian guano soon increased rapidly, at the expense of the raw material.

It is a generally conceded fact, that the large annual consumption of Peruvian guano in Germany, which amounted to 80,000 tons in 1870, is mainly due to the introduction of the soluble article. Our home consumption is reported to be from 25,000 to 30,000 tons per year, and to have, of late, fallen off, rather than increased.

There are two circumstances in particular, which render advisable the substitution of the new form of the Peruvian guano in place of the raw material.

First. The chemical composition of the new fertilizer can be readily brought to a uniform one, and the guarantee of a definite percentage of nitrogen protected against evaporation and of phosphoric acid soluble in water, renders its use more safe as compared with the raw genuine but changeable article; and

Second. The superior mechanical condition of the soluble or rectified guano, on account of the repeated grinding and screening in course of its manufacture, favors in an unusual degree its uniform distribution throughout the soil.

Judging from the experience of the past, it is quite safe to assume that the introduction of a reliable soluble or rectified

Peruvian guano into our markets, will eventually not only pecuniarily benefit both the manufacturers and the consumers, but for obvious reasons also exert a beneficial influence on the character of the entire trade in fertilizers.

I visited the works of Messrs. Hobson, Hurtado & Co., in Brooklyn, during the month of August, and saw their arrangements for the manufacture of the rectified Peruvian guano.

The entire management is under the direction of an experienced chemical engineer.

The following analytical results were obtained from a sample taken from a ton ordered by Pres. W. S. Clark of the Massachusetts Agricultural College for experimental purposes on his private grounds. It is but fair to state, that it came from one of the first lots manufactured.

RECTIFIED PERUVIAN GUANO.

Manufactured by Messrs. Hobson, Hurtado & Co., of New York City.

	Found.	Represented.
Total phosphoric acid,	12.60	–
Soluble " "	10.55	10.50
Reduced " "	1.20	–
Insoluble " "	0.85	–
Total nitrogen,	9.36	–
Being found present as actual ammonia,	6.80	10.50
And potential ammonia,	4.56	
Potassium oxide,	1.99	2.00
Moisture,	14.70	–

RECTIFIED PERUVIAN GUANO.

[*Valuation per ton of 2,000 pounds.*]

211.0	pounds	soluble phosphoric acid,	$26 34
24.0	"	reduced " "	2 40
17.0	"	insoluble " "	0 85
187.2	"	nitrogen,	46 75
39.8	"	potassium oxide,	3 14
		Total,	$79 48

One ton of 2,000 pounds of this fertilizer is offered for sale at $60 currency. The mechanical condition of the article was good,—being of a dry, pulverulent form, it was fit for immediate application.

The rectified Peruvian guano, like all other concentrated soluble fertilizers, ought to be mixed with three or four times its bulk of earth before being applied to plants.

It is the intention of the manufacturers of this new fertilizer to place, before long, a second kind of rectified Peruvian guano in our markets, which shall be guaranteed with 15 per cent. of soluble phosphoric acid, and but 5 per cent. of nitrogen.

Raw guanos, like those described above as Nos. III. or IV., furnished suitable material for that contemplated brand, which evidently is calculated to enter into a closer competition with the largest bulk of our commercial fertilizers, the ammoniated superphosphates.

None familiar with the subject under discussion can fail to recognize that Messrs. Hobson, Hurtado & Co., in establishing their trade on a more satisfactory basis by guaranteeing a definite composition, and thus rendering ascertainable the exact commercial value of their fertilizer, are presenting an unusually strong claim for a fair share of future patronage on the part of our farming community.

In calling attention to this fact, I intended, by no means, to state, that the rectified Peruvian guano may be considered a universal manure; *i. e.*, a manure which furnishes all the essential elements for plant-growth. To secure the full benefit of both kinds of Peruvian guano, requires, not unfrequently, the addition of other fertilizing materials to supplement the natural resources of the soil, and thereby render the latter capable of supplying efficiently the periodical special wants of the plants under cultivation. Both contain, mainly, nitrogen, phosphoric acid and lime, besides some small percentage of potassa and magnesia.

The rectified guano contains the main portion of the phosphoric acid in a very soluble form; and most of its lime, in consequence of the addition of sulphuric acid it received for its production from the raw material, is present as sulphate of lime or gypsum; otherwise, there is but little difference between the two, as far as the essential features of fertilizers are concerned. The rectified guano, being the more soluble of the two, acts quicker, and may therefore be more safely applied for spring manuring and top-dressing.

Prof. A. Stockhardt, the distinguished agricultural chemist of Tharandt, kingdom of Saxony, who, for years, has studied the agricultural experiments with the new guano fertilizers, recommends the following admixtures for various farm crops:

	Rectified Peruvian Guano.	Bone-meal.	Superphosphate containing 9 to 10 per cent. soluble phosphoric acid.	Sulphate of potassa equal to 40 per cent. of potassa.	Chloride of potassium (muriate of potash) equal to 50 per cent. of potassa.
For rape and winter cereals,	100	100	–	–	20
Summer cereals, etc., .	100	–	40	–	20
Potatoes, cabbage, etc., .	100	–	50	40	40
Turnips, fodder, beets, .	100	–	75	–	50
Sugar-beets, hops and tobacco, ...	100	–	75	50	–
Leguminous plants, grass, clover, etc., . . .	100	–	100	–	40

From 300 to 400 pounds of the mixtures is usually applied per acre. Any additional amount of lime, which may be very desirable, for instance, in case of tobacco, beans, pease, clover, etc., ought to be applied at a time remote from that of the application of the guano.

Manuring with burnt lime or marl, as a general rule, produces the best results, when carried on during the fall preceding the cultivation of the crops, which feed largely upon lime; for the special wants of lime and magnesia are, in consequence of a favorable distribution, more effectually furnished; the latent resources of the soil are rendered available sooner, in consequence of an increased disintegration of various organic and inorganic soil-constituents during the winter season; and finally the lime becomes thoroughly incorporated into the soil, which prevents its powerful reaction, on the ammoniacal compounds in guano and similar fertilizers, causing the ammonia to escape into the air.

The rectified guano deserves the particular attention of gardeners and florists, on account of its fitness for liquid manuring.

The following composition is highly indorsed as an efficient, complete liquid manure: 100 quarts of water, 2 pounds of

rectified guano, 4 pounds of a pure bone superphosphate, containing from 9 to 10 per cent. of soluble phosphoric acid; and 2 pounds of muriate of potash, containing 80 per cent.; this mixture is, soon after a good stirring, fit for use.

Fish Guano.

The statistical statements in my previous reports, regarding the extent of the business transactions of the Menhaden Oil and Guano Association, which represents most of the fish-rendering establishments along the Atlantic Coast, from New Jersey to Canada, cannot fail to demonstrate the unusual importance of the fish refuse from that source for agricultural purposes.

Their official report of 1874 stated the production of fish guano to be somewhat above 50,900 tons; during the past year it amounted to 53,625 tons. These figures, I presume, refer to the crude stock, containing from 50 to 55 per cent. of moisture. Adding to this amount the large quantity of fresh fish used by farmers near the sea-shore, which, as a general rule, is not referred to in our market records, it becomes evident that the money value represented in our fish fertilizers, even at the ordinary commercial rates, is second to none of the crude stock of our leading commercial fertilizers.

The comparative cheapness of the fish pomace in its crude state, as it comes from the press, has caused its present extensive application as nitrogenous animal matter for the manufacture of the main bulk of our home-made fertilizers—the ammoniated superphosphates.

An exceptional low price of nitrogen-furnishing substances,* as well as the high premium on gold during the past season, has favored various attempts to export the menhaden fish refuse in bulk to England. The material being carefully packed, arrived in good condition, and brought, it is stated, in case of a guarantee of 6 to 6.5 per cent. of ammonia (= from 5 to 5.35 per cent. of nitrogen), fourteen dollars per ton.

Whatever credit we may feel obliged to accord to that

* Sulphate of ammonia, which not long ago sold at 5½ to 5 cents per pound, has been of late offered at from 4¼ to 4 cents per pound, in quantities not less than a ton; and with a guarantee of 25 per cent. of ammonia (= 20.6 per cent. of nitrogen), making the price of nitrogen 20.6 cents per pound.

enterprise from a general commercial stand-point, we can but deplore, in the interest of the development of our agricultural industry, the exportation of one of our most valuable home resources of nitrogenous-phosphatic fertilizers, as long as we import Peruvian guano, Chili saltpetre and rock phosphates, at comparatively much higher rates for agricultural purposes.*

Recognizing the serious consequences of this tendency in our fertilizer trade, it seems but proper for agriculturists to inquire into the cause or causes which threaten to deprive us of a valuable and cheap home fertilizing material like fish.

As a short discussion of the present condition of the fish fertilizers at home and abroad may aid in rendering more prominent the agricultural interests involved in the manufacture of a good fish guano, I propose to present subsequently a few statements bearing upon that question.

The fish refuse enters our market in three different conditions: *first*, as crude stock, with about 50 to 55 per cent. of moisture, which during late years has sold at the works from $9 to $12 per ton; *second*, as fish scraps in a partly dried state, varying in moisture from 20 to 40 per cent., selling from $15 to $18 per ton; and *third*, as fish guano, containing from 8 to 20 per cent. of moisture, selling from $35 to $40 per ton.

For illustrations regarding these figures, I refer to my first official report,—of 1873–4. I stated on that occasion that the line of distinction between fish scraps and fish guano is not unfrequently too loosely drawn to prove equally acceptable to dealers and consumers.

The unusual variations in moisture, and the generally inferior mechanical conditions of our fish guano, are no doubt some of the main objectionable features which have prevented thus far a more extensive call for our fish refuse as an independent fertilizer, and compelled dealers, it appears, to look for foreign markets.

My attention during the past season has been directed mainly to the condition of the fish guano; for fresh fish scraps,

* Counting the nitrogen (5 per cent.) at 20 cents per pound, it alone would be worth to us $20 per ton of fish refuse. The latter also contains from 4 to 5 per cent. of valuable phosphoric acid, thus giving it an additional value of from $4 to $5 per ton, at present rates.

on account of their low price, do not come under the control of the law for the inspection of fertilizers.

I.—Fish Guano.

(Geo. W. Miles's Company, Milford, Conn.)

Moisture at 100°–110° C.,	17.50 per cent.
Organic matter,	53.20 "
Ash-constituents,	29.30 "
Phosphoric acid in ash,	7.72 "
Nitrogen in organic matter,	6.46 "

Valuation per ton of 2,000 pounds.

154.4 pounds of phosphoric acid,	$9 26
129.2 " of nitrogen,	32 30
	$41 56

This sample of dry, ground fish guano was of a finer mechanical condition than commonly noticed. This mass was, however, of an unusual dark brown color, and of a strong, peculiar odor, apparently due to some overheating during its drying.

II.—Dry Pure Fish.

(Sold by the Quinnipiac Fertilizer Co., New Haven, Conn.)

Moisture at 100°–110° C.,	13.38 per cent.
Organic matter,	65.96 "
Ash-constituents,	20.66 "
Phosphoric acid in ash,	7 82 "
Nitrogen in organic matter,	7.04 "

Valuation per ton of 2,000 pounds.

156.4 pounds phosphoric acid,	$9 39
140.8 " nitrogen,	35 20
	$44 59

The article compared very well, as far as its mechanical condition and its chemical composition are concerned, with the better quality of that fertilizer offered for sale in our vicinity.

III.—Fine Ground Fish Scraps.

Moisture at 100°–110° C.,	10.14 per cent.
Organic matter,	69.01 "
Ash-constituents,	20.85 "
Phosphoric acid in ash,	7.63 "
Nitrogen in organic matter,	8.35 "

Valuation per ton of 2,000 pounds.

152.6	pounds phosphoric acid,	$9 16
167.0	" nitrogen in organic matter,	41 75
		$50 91

This material was handed to me for a special examination regarding its per cent. of nitrogen. The color, mechanical condition and chemical composition of the samples tested left no doubt about its superior fitness for fertilization. Mr. D. A. Horton, of North Hadley, had produced this guano by drying fish scraps sufficiently to enable their thorough grinding in a common mill to a fine, uniform powder of a light brown color.

IV.—Dried Fish Scraps from Booth Bay, Maine.

Moisture at 100°–110° C.,	10.00	per cent.
Organic matter,	70.75	"
Ash-constituents,	18.25	"
Phosphoric acid in ash,	8.46	"
Nitrogen in organic matter,	8.14	"

Valuation per ton of 2,000 pounds.

169.20	pounds of phosphoric acid,	$10 15
162.80	" of nitrogen,	40 70
		$50 85

The fish mass which served for this analysis had been collected by me on a late excursion to Booth Bay Harbor, Maine, for the purpose of studying the fish-rendering business in that locality. The adjoining towns, Booth Bay and Bristol, alone produced, according to the statements of Hon. S. L. Goodale, of Saco, during the year 1873, not less than 1,000,000 gallons of oil and 20,000 tons of fish scraps. The sample previously reported was obtained at the chemical works under control of Mr. Goodale, where at that period large quantities of fresh scraps were delivered direct from the press of an adjoining fish-rendering establishment. In adopting this course, I felt confident of having secured a fair chance to ascertain on a reliable material the composition of well-rendered and carefully-dried menhaden fish. About one-third (3.3 parts) of the entire amount of phosphoric acid proved to be soluble

in citrate of ammonia. Ether abstracted at ordinary temperature 18 per cent. more of a thick, highly-colored, oily mass. The following rules of rendering the fish were stated as being customary in the establishment above mentioned: the fish were boiled for about one-half to three-quarters of an hour, by means of steam of from 70 to 80 pounds' pressure, in large wooden tanks with false bottoms; and subsequently, after the soup had been withdrawn, subjected to a pressure of about 115 to 120 pounds per square inch. The fish mass, in consequence of its gelatinous condition, retains usually still from 50 to 55 per cent. of moisture. In a large fish-rendering establishment near New York City, I noticed that the boiling of the fish was continued only 25 minutes, with steam of 50 pounds' pressure, and the rendered fish mass subsequently treated with 160 pounds' pressure per square inch.

The soup, which contains besides the oil more or less of the glue-producing, soluble nitrogenous matter of the flesh and the bones, is at present discharged after, by means of settling-tanks, the oil has been carefully removed. This practice causes a considerable waste of nitrogen. The yield of oil differs, often widely, even during the same season, being, it was stated, usually highest during autumn. The rendering begins usually in May or June, and closes late in the fall. The quality of the fish refuse in general, independent of its moisture and mechanical condition, depends quite naturally to a large extent on the following circumstances:—

First. On the kind used, and whether entire or in part.
Second. On the peculiar mode of rendering.
Third. On the time when the fish are caught.
Fourth. The course pursued in keeping and preparing the refuse for the general market.

Each of these circumstances exerts an influence of its own on the composition of the fish guano.

Judging from general appearances, but little attention is paid thus far to the first three conditions; the influence of the last one is, more or less, fully understood, yet not satisfactorily controlled. A main difficulty, no doubt, arises from the irregular arrival of large quantities of fish at one time during

the season; and the means, which are at present usually employed to meet this difficulty, are, quite frequently, inadequate to the demand. Many manufacturers of fish oil consider it, therefore, apparently a safer proceeding to dispose at once of their crude stock at low rates, than to run the risk any longer. Without questioning the soundness of their course of action, in case of limited pecuniary means, there seems to be no valid reason why improvements should cease here as long as it is daily demonstrated that it pays well to collect animal refuse matters from all over the country and to work them into valuable concentrated fertilizers.

Nobody familiar with the nature of a good fish guano considers it less efficient for agricultural purposes, than any other animal refuse matter of a corresponding percentage of phosphoric acid and nitrogen. In fact, all true guanos, the Peruvian not excepted, owe their most valuable constituents, in a controlling degree, directly or indirectly to the fish.

Our fish guano consists of the entire body of the manhaden fish, which has been deprived purposely, of its main portion of fat, and incidently, more or less completely of its soluble nitrogenous matter. The more the flesh predominates, the more the fat has been abstracted without the application of an excessive heat, as far as time and degree are concerned, the higher will be the commercial value of the residue of the press in case of an equal percentage of moisture. The flesh of the fish, like that of our domesticated animals, contains on an average 15 per cent. of nitrogen. The same close approximate relation exists between the bones and the textures of these otherwise widely differing classes of animals; for the fish-bones and the scales consist, mainly, of a varying quantity of cartilaginous (nitrogenous) matter and of (tricalcic phosphate) bone phosphate.

To produce a fish guano which contains in a given quantity the largest possible amount of nitrogen, must be the principal aim of the manufacturer. It brings the highest pecuniary compensation; for one percentage of nitrogen is commercially equal to four per cent. of phosphoric acid.

During the past, it is true, there has been little inducement for considerations of this kind on the part of the manufacturer, because practically there has been scarcely any serious

discrimination on the part of the consumers regarding the exact relative chemical composition of the various fish guanos offered for sale.

The future prospect of this branch of home industry depends, in an unusual degree, on the exertions which hereafter shall be made, on the part of the manufacturers, to meet the present more exacting conditions of the trade in fertilizers.

To derive any full benefit from the capital invested, renders it advisable, for all parties pecuniarily interested in the fish guano manufacture, to favor a closer scientific investigation into the changes, which the menhaden fish undergoes during the customary mode of rendering.

Loss of nitrogenous matter, in consequence of misapplication of heat, seems to be not always compensated for by an increase of the yield in oil.

The latter, when left in the fish mass in an undue proportion, reduces, to say the least, the commercial value of the guano by adding a worthless matter, which may affect seriously the analytical results, as far as its percentage of nitrogen is concerned. To heat the fish to a higher temperature, or for a longer period of time than is required to secure the largest possible amount of oil, reduces, invariably, the commercial value of the fish mass for agricultural purposes. A few subsequent analytical statements, regarding the composition of fish, and the degree of the changes which they may suffer by steaming and rendering, may serve as a practical illustration of my previous remarks.

A well-dried and finely-ground fish guano is one of our best substitutes for Peruvian guano, and ranks equally high with the best quality of animal dust from our butcher refuse establishments. It deserves the liberal patronage of farmers wherever a rich nitrogenous phosphate is called for.

I have shown in a previous report, that, as a general rule, the high grades of superphosphates are cheaper than our low grades; the same rule applies to nitrogenous materials.

The recent changes in our fertilizer trade tend to stimulate improvements in the modes of their manufacture, by rendering true merits prominent, which, as a natural consequence, secures a reliable patronage only to the best quality. We are not yet suffering from an overstocking of our fertilizer markets

on account of overproduction of home-made fertilizers obtained from suitable home resources.

Millions of dollars are annually sent abroad still, for the importation of materials, which, in their crude form, are by no means better than what we have in abundance at home.

The manufacture of fertilizers has become in the same degree an art, as agriculture itself has justly assumed the claim of being a science.

The production of fish guano, although respectable already, as far as quantity is concerned, is thus far but incidental to the menhaden fish-rendering industry.

It remains still an open question whether our resources for the manufacture of fish guano do not extend beyond that branch of industry.

To furnish some material for consideration regarding that important topic, I propose to close this statement with a short sketch of the history and the present condition of the manufacture of fish guano in Europe.

At certain periods of the year, there are noticed along the coast of Sussex, Kent and Essex counties, in England, large quantities of little herrings *(Clupea sprattus)* which for generations have been used by farmers in that vicinity for fertilizing purposes. Messrs. Pettit and Green secured, in 1851–52, patents for the manufacture of fish guano from these fishes. Thompson and Way, who analyzed their product at different times, state the percentage of nitrogen respectively at 11.5 per cent. and 13.83 per cent.

The following course, it is stated, was adopted to produce that guano: the fishes are cut fine by suitable machines, after which they are treated with a few percentages of sulphuric acid, and subsequently subjected to the efficient action of centrifugal apparatus for the removal of moisture. The pulverulent mass resulting was subsequently dried under stirring with rakes upon a heated surface, and afterwards ground into a uniform fine powder. A. Stöckhardt, in whose laboratory the changes which fresh fish undergoes by steaming—the usual treatment applied in our fish-rendering establishments—have been carefully studied, found that 100 parts of common herrings, subjected for one hour to the action of steam, furnished ultimately 24.6 parts of perfectly dry guano.

This guano contained 7.75 per cent. of nitrogen, whilst 4.18 per cent. of the nitrogen of the fish was found in the soup. The fat in the soup amounted only to 1.10 per cent.; 4 parts of the fish had produced 3.3 parts of soup.

Our fish-rendering establishments discharge the soup. Manufacturers in Norway turn the latter to account for the manufacture of a low quality of glue, after the fat has been collected.

The glue obtained contained from 7 to 8 per cent. of nitrogen, and, after grinding, can be applied with advantage for fertilizing purposes.

Messrs. Demolen & Thurmeyssen introduced the fish guano manufacture into France about the same time, or shortly afterwards, as Pettit in England. Their establishments were situated at Concarneau, in France, where a species of sardines is worked into guano. The composition of their articles is noted by Payen as containing 11.6 per cent. in nitrogen and 10.3 per cent. of phosphoric acid. The fat in the guano amounted only to 2.5 per cent. Germany receives of late a large supply of excellent fish guano from establishments along the Baltic Sea, and also from the more northerly located Norwegian fisheries upon the Lofoten Islands. The Norwegian fish guano is derived from two sources: the head and the backs of the codfish (stockfish), and also from the flesh and the bones of the polar fish. The guano from the first-named source is at present so highly improved that the manufacturers are enabled to guarantee from 11 to 12 per cent. of nitrogen, and from 5 to 6 per cent. of phosphoric acid. In 1870 the average composition did not differ much, as a general rule, from 8 per cent. of nitrogen and 12.8 per cent. of phosphoric acid; commercially considered, a difference of $10 per ton in favor of the former. The polar fish or whale guano is obtained from the rendered flesh and bones of the entire whale.

The composition of the whale guano is guaranteed to be 8 per cent. of nitrogen and 12 per cent. of phosphoric acid.

The following analytical results of A. Stöckhardt, regarding the composition of the flesh and the bones of the whale, may not be without interest in this connection:—

I.—Flesh of the Whale.

	Raw, per cent.	Perfectly dry (including fat), per cent.	Without fat and entirely dry, per cent.
Water,	44.50	–	–
Fat,	22.81	40.70	–
Flesh,	32.10	57.44	96.80
Mineral constituents (ash),	1.04	1.86	3.20
Nitrogen,	4.86	8.68	14.60

II.—Steamed Bones of the Whale.

Water,	3.84 per cent.	
Cartilaginous mass (glue)	34.60 "	=(3.5 per cent nitrogen.)
Fat,	1.34 "	
Bone phosphate of lime,	51.66 "	=(23.66 per ct. phosphoric acid.)
Carbonate of lime,	8.56 "	

The most remarkable enterprise in this direction, of a quite recent date (1870–1873), is the establishment of fish guano works on the Norwegian-Russian border,—70° north latitude, —by Captain Svend Foyn. The latter is working the refuse from his whale rendering establishments into a fertilizer; his calculation is based on the material annually obtained from 40 to 50 whales.

The entire result of his guano operations have been secured by Mr. Meinert, of Saxony, who has been for years successfully engaged in improving the quality of the fish guano from the extensive fisheries of northern Europe. A whale, according to Captain Svend Foyn, weighs on an average 230,000 pounds (115 tons); each fish furnishes about 80,000 pounds of fat, several hundred pounds of whalebone, and 100,000 pounds raw stock for fish guano; fifty whales are expected to produce 2,500 tons of the latter, containing 8 per cent. of nitrogen and 12 per cent. of phosphoric acid.

In view of the various sources of fish refuse turned to account elsewhere, and knowing that almost every kind of fish will furnish suitable material for the manufacture of guano, it seems but proper to ask whether our resources for the

manufacture of a valuable fish guano, have been already turned to account to their full extent.

The interesting statistical statements regarding this question, contained in an excellent report of Hon. S. L. Goodale, of Saco, Maine,—"Our Fish Fertilizers," 1863,—and the valuable communications of an earlier date of Prof. S. W. Johnson, of New Haven, Conn., on the manufacture and quality of fish guano in Europe, have not yet received that careful consideration which they deserve.

Abstract from the Annual Report of the 12th of January, 1876, of the United States Menhaden Oil and Guano Association for the year 1874 to 1875.

Number fish caught in 1874,*	492,878,000
" " " in 1875,	563,327,000
Increase in fish in 1875,	70,449,000
Amount of fish guano made in 1874,	50,976 tons.
" " " in 1875,	53,625 "
Oil manufactured in 1874,	3,372,847 gallons.
" " in 1875,	2,681,487 "
Decrease in oil made in 1875,	691,360 gallons.
Oil on hand at the close of 1874,	640,000 gallons.
" " " " of 1875,	125,000 "
Guano on hand at the close of 1874,	5,200 tons.
" " " " of 1875,	1,850 "
Number of men employed in 1874,	2,438
" " " in 1875,	2,633
Number of sailing vessels employed in 1874,	283
" " " " in 1875,	304
Number of steam vessels employed in 1874,	25
" " " " in 1875,	39
Number of factories in 1874,	64
" " in 1875,	60
Amount of capital invested in 1874,	$2,500,000 00
" " " in 1875,	2,650,000 00

* 1874,—1,642,927 barrels of fish; 1875,—1,877,676 barrels of fish.

"The stock on hand is much less than has been known at this season for several years, the demand being beyond the supply. Within the past month some 4,000 tons of guano have been shipped to England, where a large demand is springing up, as the result of some small experimental shipments made last year. The West India trade is also increasing. The stock on hand is so small, and the demand for oil and guano has increased so much, that an advance in the price of both products is confidently looked for the coming season."

I.—Animal Dust.

(Manufactured by Messrs. Chas. H. North & Co., Boston, Mass.)

Volatile and animal organic matter,	79.10 per cent.
Ash-constituents,	20.90 "
Total phosphoric acid in ash,	8.20 "
Total nitrogen in animal matter,	6.09 "
Moisture,	28.09 "

Valuation per ton of 2,000 pounds.

164.00 pounds of phosphoric acid in ash,	$9 84
121.80 " of nitrogen in animal matter,	30 45
	$40 29

The mechanical condition of the material was very good, and its relative proportion of nitrogen and phosphoric acid that of a rich nitrogenous phosphate.

Animal dust, like all animal matter, requires a certain state of dryness to retain its composition unimpaired; for it soon begins to mould and to lose nitrogen in the form of ammonia.

The sole objection which could be justly raised against the above stated article consists in the fact that it will be very apt in case of keeping to depreciate seriously in composition on account of its unusually large percentage of moisture,—from 8 to 10 per cent. of the latter is a safer condition.

II.—Acidulated Brighton Animal Dust.

(Messrs. Jackson & Bowker, Boston, Mass.)

Total phosphoric acid,	7.24 per cent.
Soluble " "	6.08 "
Reduced " "	0.84 "
Insoluble " "	0.32 "
Nitrogen,	4.93 "
Moisture,	20.83 "

Valuation per ton of 2,000 pounds.

121.6	pounds	of soluble phosphoric acid, ...		$15 20
16.8	"	of reduced " "		1 68
6.4	"	of insoluble " "		39
98.6	"	of nitrogen " "		24 65
				$41 92

This article was in a good mechanical condition; it had been manufactured for the special use of those who desired a more speedy action, than the animal dust, in its genuine or original condition, would accomplish.

On a previous occasion, I pointed out the valuable properties of this class of animal fertilizers when carefully prepared; yet it appears, from communications received, that here and there complaints have been raised regarding their merits as manures. Many of these unsatisfactory results may be traced, no doubt, to a faulty mode of application. It is quite frequently the practice among our farmers to apply their fertilizers too late in the season to render possible any decisive influence on the crops of the first year.

The spring, in this section of the country is, comparatively speaking, very short.

Coarse, and, for the larger part, insoluble manurial matters, cannot disintegrate sufficiently within a few weeks to permit an advantageous diffusion throughout that body of the soil upon which the coming crops are to feed. Animal dust, as a general rule, if not applied late in the fall, ought to be composted at least a few weeks before it is incorporated in the soil. A second cause of unsatisfactory results is apparently due to the quite common practice of placing more or less of the fertilizer in bulk, without any other further preparation, near the seeds. This mode of using fertilizers is only safe when the fertilizer is sufficiently diluted to prevent a serious reaction on the young plant. Our old-fashioned, diluted commercial fertilizers could be used without any farther manipulation, in many instances, with but little risk; the better class of our concentrated soluble commercial fertilizers of the present day, ought never to be applied in their genuine condition directly to the seed; it is essential for success that they be mixed previously with at least three or four times

their weights of common soil; in case of saline fertilizers, as German potash salts, larger quantities of soil are recommendable.

The main object of manuring ought to be to diffuse the soluble plant-food throughout the entire body of the soil upon which the crops shall feed. The physical condition of the soil, the kind of crop to be raised, and the character of the fertilizer to be applied, ought to be carefully consulted regarding the most suitable time for manuring. We aim manifestly at the manuring of the soil, and not that of the seed; to accomplish the first purpose is essential for success; to attempt the latter, requires, to say the least, a careful management.

Decaying animal and vegetable matters are rather the home of the parasites than of farm plants; the latter will only benefit from their presence in the same degree as they are resolved again into those simple compounds which are known as essential elements of plant-food; namely, carbonic acid, phosphoric acid, potassa, etc.

There can be no doubt but that a little better attention to the points previously discussed will soon reëstablish in our mixed system of farming the well-deserved reputation of animal fertilizers like *animal dust*.

A more liberal patronage would indirectly benefit our agricultural interests by counteracting a late commercial movement, which seems rather increasing than decreasing; namely, to export our butcher refuse material as crude stock to England at a *lower* price, if I am correctly informed, than our farmers could afford and would be willing to pay.

NITRATE OF SODA *(Chili Saltpetre).*

	I.	II.
Nitric acid,	61.60	61.60
Sodium oxide,	35.50	–
Chlorine,	0.33	0.360
Sulphuric acid,	0.17	0.082
Magnesia,	0.01	–
Lime,	0.11	–
Moisture,	2.28	2.50

Sample No. I. was collected from a Boston dealer, and No. II. from a farmer in Mansfield, Massachusetts; both proved, according to the above-stated analyses, to be of a very good kind. A good average quality of Chili saltpetre contains 95 per cent. of pure nitrate of soda, and sold during the past year for from $4\frac{1}{4}$ to 4 cents per pound. The price of nitrogen in the form of Chili saltpetre has been about 25 cents per pound during the past year. The reputation of the Chili saltpetre as an efficient source of nitrogen for top-dressing, or for late spring application, in case of soils rich in phosphates, is steadily gaining ground. It acts, as a general rule, best in dry seasons, which is partly ascribable to the fact that it increases the hydroscopic qualities of the soil.

Dried Blood.

Moisture,	15.89
Nitrogen,	7.80

(Equal to 9.5 per cent. of ammonia.)

The sample tested had apparently suffered from an excessive heat during the process of drying. A carefully dried pure blood contains from 14 to 15 per cent. of nitrogen. One hundred parts of good blood, varying from 1.045 to 1.075 specific gravity, furnish about 20 parts of dry mass.

Dry blood is a superior source of nitrogen for fertilizing purposes, and therefore is frequently used as a concentrated stock for the manufacture of our common nitrogenous or ammoniated superphosphates.

There are two grades of dry blood in our markets, containing respectively from 10 to 12 per cent. and 6.5 to 8.5 per cent. of nitrogen.

The differences in moisture of various articles may also be sufficiently large to affect seriously their relative commercial value. The price of dried blood may thus differ per ton from $20 to $40 without being necessarily too high or too low in either case.

Consumers do well to buy always with a special reference to the percentage of nitrogen of the article offered for sale; the latter sells at from 21 to 22 cents per pound.

The manufacture of dry blood for fertilizing purposes is

usually carried on in the following way: large quantities of fresh blood—from two to three tons at the time—are filled into wooden or iron tanks of suitable size, containing double bottoms several inches apart. The upper (or false) bottom is thoroughly perforated by numerous small holes, and covered over with coarse sacking to serve as a filter.

The two bottoms have also one larger communicating hole, which is closed with a well-fitting stick reaching to the surface of the vessel. The latter is used for the discharge of the liquid which has passed through the filter after the treatment of the blood has ceased.

A suitable steam-pipe passes directly down to the filter. The excess of the steam is controlled by a wheel-valve fastened in the pipe somewhere near the boiling vessel. As soon as the latter is charged with blood, the steam is turned on for about one hour. During this time the liquid is continually agitated. The nitrogenous or albuminous mass of the blood, which in consequence of that operation has become coagulated and has formed a flocculent mass, is collected upon the filter, after the liquid has been discharged, and subsequently dried by steam. The amount of nitrogen lost by discharging the liquid portion does not exceed one-half of one per cent. of the entire quantity present.

Ground Horn and Hoof.

The substance submitted to an analysis was of a grayish yellow color, and in a fine pulverulent condition; it contained 15.49 per cent. of nitrogen. This highly nitrogenous fertilizer, which but recently has been introduced into our markets, is usually prepared in the following way: the pieces of horn and hoof are filled into a cylinder similar to those used for steaming bones, and subjected for several hours to the action of steam of from two to three pounds' pressure. According to the size of the material treated, the time is extended or shortened.

The horn, after being properly treated, is soft, like rubber; dried by hot-air it becomes brittle, and is easily ground into a fine powder, which decays quite readily in moist soil. Hair, refuse wool, feathers and whalebone are of a similar composi-

tion, and may be prepared in the same way. They are in fact only fit for an economical application as nitrogenous fertilizers, when reduced to a fine powder.

These substances contain in their pure condition from 11 to 13 per cent. of nitrogen; yet, coming as refuse mass from various industrial branches, it is well for farmers to count only on about half that amount. Woollen refuse has been noticed to contain even as low as from three to four per cent. of nitrogen. Among the various refuse materials resulting from the working of different kinds of animal textures, the leather refuse is probably most prominent.

Ground refuse leather, even after steaming, is of but little value for agricultural purposes; although its percentage of nitrogen may be from 5 to 9 per cent., the presence of the tannic acid retards greatly its disintegration and subsequent action.

To secure the full benefit of the nitrogen in the leather refuse requires a destruction of the leather; a result which may be secured by dissolving the leather mass in boiling concentrated sulphuric acid of 50° to 60° Baume specific gravity. The operation is usually carried on in leaden or cast-iron vessels, and the sulphuric acid being thus charged with the nitrogenous mass is subsequently turned to account for the manufacture of superphosphates.

Sulphate of Ammonia.

	I.	II.	III.
Nitrogen,	19.70	20.18	20.60
Ammonia,	24.00	24.50	25.00
Sulphuric acid,	60.67	57.68	59.78

Samples Nos. I. and III. were taken from articles sold by dealers of New York City; Sample No. II. was collected of a Boston dealer. All three samples were of bluish white color, and of a slightly acid reaction; they represented in every respect a good quality of their kind. Besides this light-colored and good quality of sulphate of ammonia, there has

been noticed a crude article of a reddish or brown color, which in several instances has been traced back to an English establishment. This crude sulphate of ammonia contains quite frequently varying quantities of a poisonous ammonia compound, which is known to chemists by the name of rhodan or sulphocyan ammonium.

The presence of this injurious compound is due either to a faulty process of manufacture, or to a direct evaporation to dryness of the mother liquor from which the crystallized sulphate of ammonia has been gathered, instead of separating the ammonia from the residual solution by means of lime. In one instance the entire crude compound consisted mainly of 73.94 per cent. of crude ammonia and 14.87 per cent. of sulphate of ammonia.

Sixty pounds of that article applied to one acre of meadow land in Germany destroyed the entire grass crop. Thirty-eight pounds of that same material added to a superphosphate used upon one acre of land turned to account for the production of potatoes, reduced the yield to one-third as compared with the effect of the same amount of superphosphate without that spurious ammonium sulphate. Of still later date is an interesting observation regarding its effect on barley. Seventy-five pounds of an English ammoniated superphosphate containing 10 pounds of soluble phosphoric acid and 7 to 8 pounds of nitrogen was applied per acre at this low rate, for the cultivation of barley.

The seed germinated very slowly; the young germs were of a yellowish white color; the entire young plants were very feeble and the majority of them soon died out. The presence of rhodan ammonium in the sulphate of ammonia may be easily proved by dissolving a small quantity of that substance in water and adding a few drops of sesquichloride of iron, which produces in that case a deep red color.

The price of a good sulphate of ammonia has been from $4\frac{3}{4}$ to $4\frac{1}{4}$ cents per pound in case of 25 per cent. of ammonia or 20.6 per cent. of nitrogen.

Mineral Phosphates.

I.—Orchilla Guano.

	Found.		Represented.	
	I.	II.	I.	II.
Phosphoric acid,	24.17	28.91	25.5	27.5
Lime,	42.39	45.00	–	–
Magnesia,	2.46	not det.	–	–
Sulphuric acid,	not det.	2.06	–	–
Moisture,	4.70	5.00	–	–

This mineral phosphate is named after the Island Orchilla (in the Caribbean Sea), which belongs to Venezuela.

The amount of this phosphate is still large according to the statements of Messrs. B. M. Rhodes & Co., of Baltimore, who act as importers' agents. The material consists mainly of tricalcic or bone phosphate (55 to 65 per cent.) and of carbonate of lime. In its natural state it forms a soft, pulverulent mass, of a yellowish white color, and contains but traces of organic matter.

The samples tested have been secured from different parties.

II.—Estrella Guano.

	Found.	Represented.
Phosphoric acid,	28.8	26.0 to 27.5
Lime,	43.49	–
Sulphuric acid,	2.03	–
Moisture,	6.50	–

This article resembled, in its fine mechanical condition, the former; yet contained a somewhat larger percentage of organic matter.

III.—Natural Caribbean Guano.

	Found.	Represented.
Phosphoric acid,	25.20	25.5 to 26.5
Lime,	37.88	–
Sulphuric acid,	1.80	–
Moisture,	8.90	–

It was a pulverulent mass, like the two preceding samples, containing less carbonate of lime.

IV.—Natural Serrano Island Guano.

Phosphoric acid,	12.16
Lime,	49.25
Sulphuric acid,	0.58
Organic matter,	3.00
Moisture,	10.30

The bone phosphate in this article amounted only to from 26 to 27 per cent., whilst the carbonate of lime reaches from 62 to 63 per cent. The natural mechanical condition of this material, like that of the preceding samples, is very favorable for speedy reaction.

These four samples of mineral phosphates represent a numerous class of so-called phospho-guanos, which, on account of their richness in phosphoric acid and their excellent natural mechanical condition deserve in a particular degree the attention of all agriculturists.

As the majority of these mineral guanos contain, usually, more or less carbonate of lime, they are unprofitable for the manufacture of superphosphates; their competition in the general market is thereby limited, and they sell consequently at a comparatively low price; from $18 to $20 per ton, by a guarantee of from 24 to 25 per cent. of phosphoric acid. In my previous report I have referred already to the value of these phosphates for direct application in general farming.

To incorporate daily a certain amount into the fresh barnyard manure by scattering it over the manure pile, or to compost them for some months previous to their designed

application, is a universally indorsed practice. The good economy of applying these phosphates in a finely divided state to the compost heap, has been illustrated again quite recently by Prof. H. C. White, of Georgia.

The experiments were made with a finely ground South Carolina phosphate. The compost heap was prepared of 40 parts of earths, 34 parts of fine ground phosphate, and 31 parts of cotton-seed cake, and the mixture kept moist with water.

The compound was made in June, and tested in February. A careful estimation proved that one-third of the phosphoric acid had been rendered soluble in soil-water; the commercial value of the phosphoric acid had been increased not less than 46.4 per cent. It is quite safe to assume that any of the above stated phosphates treated in a similar way with fresh horse-manure or turf, and kept moist with urinary excretions, would have given even still higher pecuniary results.

BONE-ASH FROM SOUTH AMERICA.

Phosphoric acid,	35.89
Lime,	44.89
Sand, etc.,	4.50
Moisture,	7.00

This material was guaranteed to contain 75 per cent. of bone phosphate; it contained 78.2 per cent. of that compound. The price was stated to be $28 gold, which is rather higher than we are usually asked to pay for phosphoric acid in other equally valuable phosphates. The bone-ash of South America, although produced in unusually large quantities, is only of incidental occurrence in our markets; for the main bulk, it seems, is carried to Europe. It comes as a ballast to some of our seaport towns, and furnishes an excellent material for the manufacture of superphosphate. The above described article consisted largely of coarse fragments of calcined bones, and of a fine grayish white powder; the latter contains usually besides bone-ash some wood-ash and some sand in varying proportions.

Valuation per ton of South American Bone-Ash.

717.8 lbs. of phosphoric acid, at 4 cts. per lb., . . $28 61, currency.

Ground Bones.

I.—Fine Bones for Fertilizers.

(Collected by Messrs. Oscar Foote & Co., Boston, Mass.)

Moisture and organic matter,	29.66
Ash constituents,	70.34
Phosphoric acid in ash,	20.30
Nitrogen in animal matter,	1.50

Valuation per ton of 2,000 pounds.

406 pounds of phosphoric acid,	$24 36
30 " of nitrogen,	7 50
	$31 86

The mechanical condition of this substance was quite advantageous for speedy disintegration. Its friable texture and low percentage of nitrogen point towards a thorough rendering process. A peculiar feature of this bone fertilizer consisted in having received an addition of from 10 to 12 per cent. of common salt. The latter substance is used here and there by manufacturers for the purpose of keeping the ground bones from rotting or smelling. Well-dried bones need no such preparation. The article was offered at $35 per ton of 2,000 pounds, which is less than the usual retail price of ground bones—in their genuine state.

II.—Bonemeal for Fertilizer.

(Messrs. L. B. Darling & Co., Pawtucket, R. I. The sample was secured at the store of Messrs. J. Breck & Co., Boston.)

Moisture and organic matter,	40.30 per cent.
Ash constituents,	59.70 "
Phosphoric acid in ash,	25.26 "
Nitrogen in animal matter,	3.52 "

Valuation per ton of 2,000 pounds.

505.20 pounds of phosphoric acid,	$30 30
70.40 " of nitrogen,	17 90
	$48 20

This article was of a good mechanical condition, and its composition of a very fair average quality of moderately rendered bones.

III.—Fine and Coarse Ground Bones.

(Manufactured by Mr. J. B. Root, of Northborough, Mass., and collected at the store of Mr. J. D. Lovell, Worcester, Mass.)

	Fine Bones. Per Cent.	Coarse Bones. Per Cent.
Moisture and organic matter,	48.38	48.66
Ash-constituents,	51.62	51.34
Phosphoric acid in ash,	21.62	20.34
Nitrogen and animal matter,	4.07	4.12
Moisture (at 100° C.),	9.60	10.63

Valuation per ton of 2,000 pounds of Fine Bones.

432.40	pounds of phosphoric acid,	$25 94
81.40	" of nitrogen,	20 35
		$46 29

Valuation per ton of 2,000 pounds of coarsely-ground Bones.

406.8	pounds of phosphoric acid,	$20 34
82.4	" of nitrogen,	16 48
		$36 82

The first specimen was of the usual size of its kind, and thus better fitted for speedy action than the second or coarse one. Both samples are manufactured, according to the analytical results, from good bones; yet they differ widely in their respective agricultural values.

It is not a good practice to offer coarsely-ground bones for sale, even at reduced rates, as calculated above; for their action is quite slow, and thus too uncertain to secure a particular patronage.

The fertilizing value of ground bones of corresponding compositions stands in a direct relation to their degree of fineness. Coarsely-ground bones should never be directly applied to the soil; they ought to be composted for a few weeks with barn-yard manures before they are incorporated into the soil.

A good bone-meal penetrates more readily into the soil without suffering any serious absorption than most other phos-

phates, provided its organic nitrogenous matter is in a state of some putrefaction. A good bone-meal in a partly decomposed state has for this reason been found safer upon a calcareous or ferruginous soil than superphosphates of lime, particularly in case of the deeper-rooting crops.

The organic nitrogenous mass, which accompanies the bone phosphate (tricalcic phosphate) in the bones, is identical with glue. A fresh solution of glue does not dissolve the bone phosphate; whilst decaying glue dissolves it largely, and carries it without any serious interference to the lower layers of the soil.

To scatter ground bones daily in small quantities over the fresh barn-yard manure, designed for the cultivation of grain or root crops, is for several reasons very recommendable; it adds some of the most essential articles of plant-food—phosphoric acid and nitrogen—in a very available form, to the barn-yard manure resulting from scanty feeding; and prevents also in a large degree the escape of ammonia, which is continually produced in decaying animal excretions. A very efficient article of steamed bones for agricultural purposes is of late manufactured, by first rendering the bones for the removal of the fat; and subsequently evaporating bones and soup to dryness; it contains a larger percentage of nitrogenous matter than ordinary steamed bones. This preparation, in a finely pulverized condition, is claimed to exceed all other bone-fertilizers in efficiency, being equally well adapted to all kinds of soil.

I.—Ammoniated Superphosphates, and Superphosphates.

(Messrs. W. L. Bradley & Co's XI. Collected of Messrs. Bagg & Batchelder, of Springfield, Mass.)

	Found. Per Cent.
Total phosphoric acid, ...	11.62
Soluble " "	7.74
Reduced " "	1.06
Insoluble " "	2.82
Nitrogen, ...	2.88

Valuation per ton of 2,000 pounds.

154.8	pounds of soluble phosphoric acid,		$19 35
21.2	" of reduced " "		2 12
56.4	" of insoluble " "		2 82
57.6	" of nitrogen,		14 40
			$38 69

II.—Sea-Fowl Guano.

(Messrs. W. L. Bradley & Co. Collected of Messrs. Bagg & Batchelder, of Springfield, Mass.)

	Found. Per Cent.
Total phosphoric acid,	11.86
Soluble " "	5.60
Reduced " "	1.61
Insoluble " "	4.65
Nitrogen,	3.13
Potassium oxide,	1.25

Valuation per ton of 2,000 pounds.

112.0	pounds of soluble phosphoric acid,		$14 00
32.2	" of reduced " "		3 22
93.0	" of insoluble " "		4 65
62.6	" of nitrogen,		15 65
25.0	" of potassium oxide,		2 00
			$39 52

III.—Soluble Nitrogenous Phosphate.

(Quinnipiac Fertilizer Company, Connecticut. Collected of Charles Smith, Amherst, Mass.)

Total phosphoric acid,	7.70	per cent.
Soluble " "	6.52	"
Reduced " "	–	"
Insoluble " "	1.18	"
Nitrogen,	3.65	"
Moisture,	22.17	"

Valuation per ton of 2,000 pounds.

130.4	pounds of soluble phosphoric acid,		$16 30
23.6	" of insoluble " "		1 18
73.0	" of nitrogen,		18 25
			$35 73

IV.—Ammoniated Dissolved Bones.

(Sternfels Bone Fertilizing Company, New York. Collected at Amherst Railroad Depot.)

Total phosphoric acid,	6.45	per cent.
Soluble " "	2.70	"
Reduced " "	2.89	"
Insoluble " "	0.86	"
Nitrogen,	1.77	"
Moisture.	34.14	"

Valuation per ton of 2,000 pounds.

54.0 pounds of soluble phosphoric acid,		$6 75
57.8 " of reduced " "		5 78
17.2 " of insoluble " "		86
35.4 " of nitrogen,		8 85
		$22 24

V.—Ammoniated Superphosphates.

(Russel Coe's. Collected of James Hastings, Amherst, Mass.)

Total phosphoric acid,	11.76	per cent.
Soluble " "	9.54	"
Reduced " "	0.52	"
Insoluble " "	1.70	"
Nitrogen,	2.80	"
Moisture,	22.00	"

Valuation per ton of 2,000 pounds.

190.8 pounds of soluble phosphoric acid,		$23 85
10.4 " of reduced " "		1 04
34.0 " of insoluble " "		1 70
56.0 " of nitrogen,		14 00
		$40 59

VI.—Ammoniated Superphosphate.

(Messrs. Oscar Foote & Co., Boston, Mass.)

Total phosphoric acid,	13.94	per cent.
Soluble " "	9.50	"
Reduced " "	3.71	"
Insoluble " "	0.70	"
Nitrogen,	1.60	"
Moisture,	25.33	"

Valuation per ton of 2,000 pounds.

190.0	pounds of	soluble phosphoric acid,		$23 75
74.2	"	of reduced " "		7 42
14.0	"	of insoluble " "		70
32.0	"	of nitrogen,		8 00
				$39 87

VII.—Ammoniated Superphosphate.

(G. F. Wilson's, Providence, R. I. Collected of Messrs. Breck & Co., Boston, Mass.)

Total phosphoric acid,	10.82	per cent.
Soluble " "	3.20	"
Reduced " "	4.74	"
Insoluble " "	2.88	"
Nitrogen,	2.70	"
Moisture,	28.11	"

Valuation per ton of 2,000 pounds.

64.0	pounds of	soluble phosphoric acid,		$8 00
94.8	"	of reduced " "		9 48
57.6	"	of insoluble " "		2 88
54.0	"	of nitrogen,		13 50
				$33 86

VIII.—Patent Ammoniated Superphosphate.

(Messrs. W. L. Bradley & Co., Boston, Mass. Collected of Mr. J. D. Lovell, Worcester, Mass.)

Total phosphoric acid,	12.60	per cent.
Soluble " "	7.04	"
Reduced " "	0.54	"
Insoluble " "	5.02	"
Nitrogen,	2.50	"
Moisture,	19.94	"

Valuation per ton of 2,000 pounds.

140.8	pounds of	soluble phosphoric acid,		$17 60
10.8	"	of reduced " "		1 08
100.4	"	of insoluble " "		5 02
50.0	"	of nitrogen " "		12 50
				$36 20

IX.—Union Fertilizer Phosphate.

(Messrs. Henry F. Davis & Co., New Bedford, Massachusetts. Collected of Mr. Heman Copeland, Campello, Mass.)

Organic volatile matter,	44.55	per cent.
Ash constituents,	55.45	"
Total phosphoric acid,	11.37	"
Nitrogen,	2.32	"
Potassium oxide,	5.36	"
Moisture,	13.38	"

Valuation per ton of 2,000 pounds.

227.4 pounds of phosphoric acid,	$13 64
46.4 " of nitrogen,	11 60
107.2 " of potassium oxide,	8 58
	$33 82

X.—English Superphosphate.

(Messrs. Jacksons & Bowker, Boston, Mass.)

Total phosphoric acid,	34.54	per cent.
Soluble " "	30.00	"
Reduced " "	4.54	"
Insoluble " "	trace	"
Sulphuric acid,	23.52	"
Calcium oxide (lime)	26.72	"
Moisture,	6.10	"

Valuation per ton of 2,000 pounds.

600.0 pounds of soluble phosphoric acid,	$75 00
90.8 " of reduced " "	9 08
	$84 08

This article was represented to analyze 60 to 65 per cent. of soluble and precipitated phosphate of lime; price, $65 per ton.

ESSENTIAL CONSTITUENTS.	I.—W. L. Bradley & Co.'s XL.	II.—W. L. Bradley & Co.'s sea-fowl guano.	III.—Quinnipiac Fertilizer Co., soluble nitrogenous phosphate.	IV.—Sternfels Bone Fertilizing Co., ammoniated dissolved bones.	V.—Russel Coe's ammoniated superphosphates.	VI.—Oscar Foote & Co., ammoniated superphosphate.	VII.—G. F. Wilson's ammoniated superphosphate.	VIII.—W. L. Bradley & Co., patent ammoniated superphosphate.	IX.—Henry F. Davis & Co., Union fertilizer phosphate.	X.—Jacksons & Bowker, English superphosphate.
Total phosphoric acid, . . .	11.62	11.86	7.70	6.45	11.76	13.94	10.82	12.60	11.37	34.54
Soluble phosphoric acid, . . .	7.74	5.60	6.52	2.70	9.54	9.50	3.20	7.04	–	30.00
Reduced phosphoric acid, . . .	1.06	1.61	–	2.89	0.52	3.71	4.74	0.54	–	4.54
Insoluble phosphoric acid, . . .	2.82	4.65	1.18	0.86	1.70	0.70	2.88	5.02	–	trace.
Nitrogen, ...	2.88	3.13	3.65	1.77	2.80	1.60	2.70	2.50	2.32	–
Potassium oxide, ...	–	1.25	–	–	–	–	–	–	5.36	–

The general character of this large class of fertilizers has changed but little, so far as the total amount of essential constituents, phosphoric acid and nitrogen are concerned.

The relative amount of soluble phosphoric acid has, however, been increased in some instances at the expense of the insoluble acid. Two samples were noticeable for their large amount of moisture (Nos. IV. and VII.), a circumstance which favored a rapid formation of mould, and thereby tended to reduce their actual commercial value. The price of the latter class of ammoniated superphosphates in view of the present ruling market valuations of phosphoric acid and nitrogen ought not to exceed from $35 to $40 per ton, which is $10 to $15 less than in preceding years.

A closer investigation proves almost invariably that the best quality is also the cheapest; a fact which I asserted in my last report. A fair illustration of this statement is furnished again in No. X., the imported English superphosphate, in which the soluble phosphoric acid is sold at ten cents per pound. Some of our home manufacturers are by no means behind in offering for sale their valuable articles at low rates; in some instances at more than thirty per cent. below my last year's valuation.

As the dealers in fertilizers are quite naturally at liberty to put any kind of material at their own price in the market, provided they state the guaranteed percentage of phosphoric acid, nitrogen and potassium oxide as specified by our law for the regulation of the sale of fertilizers, it becomes the important duty of every farmer to see to it that the specification regarding the quality and quantity of these essential constituents is fastened in a readable form to every package offered for sale at a price of more than $15 per ton.

To secure to themselves the full benefit of the fertilizer law, renders it also very advisable that they should make themselves, as far as practicable, familiar with the general properties of a good fertilizer of each particular class.

It is one of the aims of these reports to serve, in the absence of better sources, as a reference regarding these points.

Ch. A. Goessmann,

State Inspector of Commercial Fertilizers.

APPENDIX I.

Market Price of Commercial Fertilizers during the past Year.

German potash salt, 23–25 per cent sulphate of potash,	$20–22	per ton.
" " " 35 per cent. " " .	35	"
" " " 54 per cent. " " .	55	"
Muriate of potash, 80 per cent. (= 50 potassium oxide),	50	"
Nitrate of potash (potash saltpetre), 95 per cent., .	165	"
Nitrate of soda (Chili saltpetre), 95 per cent., . .	80	"
Sulphate of ammonia, 25 per cent. ammonia, . .	85–90	"
Dried blood, 10 per cent. ammonia, ...	35	"
Fish pomace, 4–5 per cent. nitrogen, ...	12	"
Ground bones, 20–24 per cent. bone phosphate, . .	40	"
Superphosphate of lime, 10 per cent. sol. phosphoric acid,	25	"
" " 30–34 per ct. " " "	65	"
Boneblack, ground, 70–74 per cent. bone phosphate, .	25	"
So. Carolina phosphate, 54–56 per ct. " " .	13–14	"
Navassa phosphate, ground, 62–64 per ct. bone " .	15–16	"

APPENDIX II.

Composition of some Compounds in Fertilizers.

100 parts of nitric acid contain 26.0 parts nitrogen.
" ammonia " 54.0 " "
" nitrate of potassa contain 46.6 parts potassium oxide.
" " " (or saltpetre) contain 53.4 parts nitric acid.
" nitrate of soda contain 36.75 parts sodium oxide.
" " " (Chili saltpetre) contain 63.25 parts nitric acid.
" sulphate of potassa contain 54.9 parts potassium oxide.
" " " " 46.0 " sulphuric acid.
" sulphate of lime (free of water) contain 41.0 parts calcium oxide (lime).
" sulphate of lime (free of water) contain 59.0 parts sulphuric acid.
" sulphate of lime (with water, gypsum) contain 32.5 parts calcium oxide (lime).
" sulphate of lime (with water, gypsum) contain 46.5 parts sulphuric acid.
" sulphate of lime (with water, gypsum) contain 21.0 parts water.
" bone phosphate (or tricalcic phosphate) contain 54.0 parts calcium oxide (lime).
" bone phosphate (or tricalcic phosphate) contain 46.0 parts phosphoric acid.
" carbonate of lime contain 56.0 parts calcium oxide (lime).
" " " " 44.0 " carbonic acid.
" chloride of potassium contain 52.4 parts potassium.
" " " " 63.1 " potassium oxide.
" " " " 47.6 " chlorine.

The report was accepted.

Mr. Davis, from the committee on the assignment of subjects for essays, submitted the following report:—

1. Cheap Transportation and Marketing of Farm Products.—Messrs. Hawes, Sanderson and Davis.

2. Saving and Preparation of Manures on the Farm.—Messrs. Wakefield, Fenn and Ladd.

3. On the Size and Conduct of Farms in Massachusetts.—Messrs. Dwight, Shepley and Hawks.

4. The Improvement of Salt Marshes.—Messrs. Goessmann, Baker and Phinney.

5. Field and Garden Seeds.—Messrs. Moore, W. L. Warner and Holland.

6. The Best Methods of Bringing the Importance of Arboriculture before the Agricultural Community.—Messrs. Sargent, Hadwen and Shepley.

7. Does it Pay to Raise Corn in Massachusetts?—Messrs. Davis, L. P. Warner and Shepley.

8. The Sources of Agricultural Improvement.—Messrs. Loring, Bennett and Metcalf J. Smith.

9. The Claims of Ornamental Gardening upon Farmers.—Messrs. Saltonstall, Perry and Moore.

10. Buds.—Messrs. Chadbourne, Wilder and Clark.

11. Experiments in Potato-Culture.—Messrs. Sanderson, Knox and Vincent.

12. What has Chemistry done for Agriculture?—Messrs. Chadbourne, Goessmann and Saltonstall.

13. The Legal Rights and Obligations of Farmers.—Messrs. Bennett, Davis and Ladd.

The report was accepted.

The Committee on Printing was constituted by the appointment of Messrs. Stone, Moore, and the Secretary.

The several essays and the reports of delegates were then taken from the table, read a second time, and adopted.

The importance of securing some uniformity in the reports of delegates having been suggested by Judge BENNETT, it was—

Voted, That a committee of three be appointed to make up a list of questions to be answered by each delegate, one of such questions to be as to whether the general management of the society is worthy to receive the bounty and encouragement of the State. Messrs. Bennett, Moore and Saltonstall.

Voted, That all unfinished business be referred to the Committee on Printing, with full power.

The report upon the Agricultural College having been taken from the table, it was—

Voted, That a committee of five be appointed to memorialize the legislature in aid of the Trustees of the Agricultural College in their petition for an appropriation in aid of the college. Messrs. Wilder, Davis, Stone, Moore and Saltonstall.

Dr. LORING submitted the following communication from the Essex Agricultural Society :—

At a meeting of the Trustees of the Essex Agricultural Society, held at Plummer Hall, Salem, November 16th,—

Voted, That the delegate to the State Board of Agriculture from this Society be instructed to ask the Board for answers to the following questions, which answers shall be printed in the order of arrangements for the next cattle show, for the guidance of committees :—

First. "What *constitutes* a pure-bred animal?"

Second. "How shall an animal be *proved* to be pure bred?"

Voted, To appoint a committee to consider and report upon the reply to be made to to the questions. Messrs. Holland, Milo J. Smith and Hadwen.

Mr. Holland subsequently submitted the following report:—

Concerning the questions submitted by the Essex Agricultural Society to this Board, the Committee would say, that in their opinion the term pure bred is regarded by intelligent breeders and the public generally as applying to such animals only as have been so bred that they can transmit with certainty their peculiar qualities to their offspring.

The proof that an animal is so bred should be a record of the animal, or its ancestors, as recorded in some herd-book, recognized by leading breeders and the public generally as complete and authentic.

The report was accepted, when the Board adjourned.

It seems proper to allude briefly, in this connection, to the origin and growth of associated effort for the promotion and development of the agricultural industries of this Commonwealth. Starting from comparatively small beginnings in the organization of the Massachusetts Society for promoting Agriculture, in 1792; the Association of Middlesex Husbandmen, formed in 1794, and incorporated in 1803, under the name of the Western Society of Middlesex Husbandmen; the Kennebeck Agricultural Society, instituted at Augusta, then a part of Massachusetts, in 1800, and incorporated in 1801; the Berkshire County Society, in 1811; the Essex, the Worcester, the old Hampshire and the Plymouth, in 1818 and 1819; the number of these societies has rapidly increased till they exceed thirty, receiving a bounty from the Commonwealth.

The State Board of Agriculture was the natural outgrowth of these societies. It is not a corporate body or society, but a department of the government, organized like any other department, with His Excellency the governor, for the time being, as its head. It is composed mainly of farmers, and wholly of men chosen by and to represent farmers, with the

exception of the governor, lieutenant-governor, secretary of the Commonwealth, the president of the Massachusetts Agricultural College, and state inspector of fertilizers, who are members by virtue of their office, and three others, appointed by the governor and council, whose terms of service continue three years, one of the three being changed or reappointed each year. Each of regularly incorporated agricultural societies receiving the bounty of the State, has the power of choosing one member of the Board, whose term of service also continues three years. At present there are thirty-one of these societies, and, of course, when the Board is full, there are thirty-one members chosen by the farmers themselves, three holding offices by appointment, and five *ex officio*.

From the manner in which the Board is constituted, it is apparent that it must naturally form a pretty fair representation of all varieties of agricultural knowledge in the State. A majority of the members selected by the societies, made up as these associations are, of the most intelligent practical farmers and friends of the farming interest among us, will always be likely to be practical, intelligent farmers; while it would be strange if there were not a larger or smaller number of those who would commonly, though undeservedly, be called fancy or amateur farmers, and some men of scientific attainment. This, it seems to me, is just as it should be. All these classes actually exist, and they should all be represented in the Board, that their various opinions may be compared with each other and subjected to the test of the common-sense and sound judgment which we may reasonably expect to find in a body chosen in the manner described. In this way we may gather information from every source.

In a convention of farmers which met at the State House in 1851, and out of which the Board of Agriculture originally grew, it was resolved: "That inasmuch as agriculture is the chief occupation of her citizens, the Commonwealth in the organization of its government, should be provided with a department of agriculture, with offices commensurate with the importance of the duties to be discharged, of the abilities to be required, and of the labors to be performed."

The Act establishing the Board was passed in 1852, and

the present Secretary entered upon the duties of his office on the 14th of February, 1853. It may seem hardly proper for him to speak of the manner in which these duties have been performed, yet every farmer should know their nature and extent, and on this account I trust I may be allowed to speak freely, without incurring the imputation of arrogating to myself more credit than fairly belongs to me. I should add here, that whatever I have done, has been done by the advice and with the approbation and concurrence of the Board after careful deliberation both on their part and mine; and if any good shall be found to have resulted from our united efforts, the members of the Board should receive their full meed of approbation for it.

In the first place, the law which establishes the Board requires that "all the duties of the secretary of the Commonwealth relating to the returns of the agricultural societies shall be performed by the secretary of the Board of Agriculture." In the year 1845, a law was passed requiring the secretary of the Commonwealth to prepare an annual *Abstract of the Returns of the County Societies*. But the secretary of State was very rarely a man specially interested in the subject, besides which innumerable other duties made it impossible for him to do the work himself. Hence it was done out of his office, and the Commonwealth was charged with the extra service, and this arrangement continued down to the time of the establishment of the Board. The volume was substantially a reprint of the county transactions, the different reports being but little condensed. When the Board of Agriculture undertook the preparation of the volume for 1853, an entirely new system was adopted, the material was arranged according to subjects, thus bringing together all the statements and experiments in all parts of the State, making the whole far more convenient for reference and more interesting and useful, while a complete index was added at the end, increasing the value and usefulness of the volume manifold. A new feature was added to the volumes with but little expense to the State, in the shape of illustrations of animals and farm buildings, and I might quote innumerable letters from farmers in other States, and appeal to the almost universal testimony of the agricultural

press to show that the report is inferior in interest and value to no similar state publication in the country.

But, in addition to this Abstract, the law requires an annual report of the Board of Agriculture, and these reports are to be prepared by the Secretary. I have labored to make them of interest, and of immediate practical value to the farmers of the State. It is but justice to myself to say, that though the expectations of the community, at the time of the establishment of the Board, had been raised to such an unreasonable height that no human efforts could be likely to satisfy them, the plan adopted in the reports has commended itself to the good judgment of those who understand best the wants of the farming community. This plan was to take up some particular topic on which the community desired information, and discuss it in the most complete and thorough manner, bringing together a mass of information which was not elsewhere available to the farmer.

In my first report, for example, among many other topics of general interest, including a sketch of the past history of our agriculture down to the present time, and a vast amount of statistical information in regard to its present condition, I entered upon the subject of the cultivation of cranberries, which, at that time, was beginning to excite considerable interest in some parts of the State. On account of the little attention which had previously been paid to the subject, information as to the natural history of the plant was difficult of access to those who wished for it. In the preparation of that part of the report, I visited many plantations, in all more than a hundred acres of cultivated cranberries, in different parts of the State, seeking information from every source. I thus brought together a greater amount of scientific and practical information, in regard to that particular crop, than had ever before been collected. I feel that I may make this statement with some degree of confidence, since I gave the subject a most thorough and searching investigation. That part of the report, and many others, were copied and quoted and circulated through the country, from Maine to Georgia, sometimes with credit to the farmers of Massachusetts, but often without. I learned soon after, from reliable sources of information, that many acres were cultivated with cranberries in

this State, which would not have been so treated but for the stimulus given by that report, and the cultivators are now receiving the most liberal rewards for their labor.

I mention this only as an example of the plan, which, after very mature consideration, and with a full knowledge of the whole field of labor, it was thought best at first to adopt, and of the good effects which have followed from it.

In a similar manner I took up the subject of grasses and forage-plants, in my fourth report, giving all the information that was available at that time, with very numerous illustrations of different species, devoting about two hundred and thirty pages to this special topic. That report awakened a new interest in that special line of investigation, and it has borne fruit since in increased attention to this subject.

The Board of Agriculture also labored to systematize the returns of the county societies, and so far succeeded as to be able to show at a glance the financial condition of each, to what objects its encouragement was extended, how much was paid for any specific object throughout the State, how generally the bounty was distributed, and how much was paid in each town in the society's limits; or, in other words, how far the influence of each society extended, and whether it had become localized, thus failing to meet the objects the legislature had in view, or was doing its work well and profitably.

Thus the Board obtains the most minute details in regard to the distribution of the bounty of the Commonwealth, a a thing which was never done, nor even attempted, to such an extent before the adoption of the present system. When it is recollected that this bounty now exceeds the sum of seventeen thousand dollars every year, no one can fail to see the importance of what has already been done in this respect, and the great good which may be anticipated from the perfection of the system. All these details appear in the annual reports already alluded to, and are within reach of every farmer in the State.

Another and a very important part of the labors of the office, is the judicious distribution of the agricultural publications of the State. This work has been performed with far greater care than ever before. One who has had no experi-

ence in similar cases, would think this to be a very simple and easy matter, and it would, indeed, require but very little time or attention merely to send them broadcast over the Commonwealth; but to distribute them judiciously, to put them everywhere into hands where they will accomplish a good purpose, and stimulate those who have hitherto taken but little interest in the improvement of their lands, and thus to make their good effects felt and seen in the whole aspect of the State, is a very different th'ng, and requires no little care and anxious thought. Many hundred volumes go each year into the distant towns which often have no representative in the legislature, and are put directly into the hands of those who will use them as a means of improvement. I might give extracts from many letters, received from different parts of the State, to show what good has come from this part of the labors of the Board; but it is enough for me to say that the object proposed in the distribution of these works was to put them where they would do most good, and to disseminate useful and reliable information among the farmers and others who desired it, all over the State. Nor can it be said, as it sometimes has been, with any justice or truth, that the distribution is partial or incomplete; for any farmer in the Commonwealth, who is interested enough in the subject to send to my office, through his representative to the legislature, or otherwise, can procure a copy of these publications, the only question asked being whether he is a farmer, and resides in this State.

The Board of Agriculture also distributed many hundred volumes of the Patent Office Report on Agriculture, subsequently known as the Reports of the Department of Agriculture, and many thousand packages of seeds, of which some were received through the Department at Washington, and others imported directly from abroad. I need not enlarge on the good which was accomplished in this way, both by the diffusion of useful knowledge, and the introduction of superior varieties of vegetables, fruits and grains. Much attention has also been paid to the establishment of an exchange of agricultural documents with other States of the Union which publish volumes similar to our own. Copies of their reports have been and are thus

regularly procured for town libraries, and thousands of volumes placed within the reach of our people. An exchange of documents with the governments of foreign countries was also instituted. At the same time, great labor was devoted to the formation of an agricultural museum, in connection with the office of the Secretary of the Board, at the State House, and some hundreds of specimens of grasses, minerals, birds, insects, and other objects of natural history, etc., were collected. It was designed, also, to procure models of all our fruits, each to be labelled with its proper name, and the local names by which it was known in various parts of the State, the soil in which it flourished best, and other items of interest and value. In short, it was designed to make a collection which should afford a perfect representation of all the agricultural products of the State, and be of direct practical value to all who desired to avail themselves of it. A very considerable collection was made, but on account of want of space in the State House, the whole was removed to the Agricultural College some years ago.

The office correspondence necessary for the attainment of all these objects grew to be very extensive, and it has continued so to the present time. Thus, the Board labored quietly and unostentatiously, but hard and constantly, confident that the farmers of the State would appreciate well-meant and well-directed efforts to promote the progress of agriculture. The members of the Board do not receive any pay for their time or their services. These are freely given to the public, and for this reason, if for no other, they deserve the generous coöperation and confidence of every farmer in the State.

The course which has been explained was, in my judgment, the best and most efficient that could be adopted. It has been the means of accomplishing more good, and has secured the confidence and respect of the people to a far greater extent than any other could have done. I leave the decision upon its merits to the good judgment of sensible men.

The Board of Agriculture, from 1854 to 1859, had charge of the State Farm at Westborough. This is a farm of two hundred and eighty-five acres, lying contiguous to the State Reform School. It was under the management of the trustees of that institution previous to its transfer to the Board in

1854. The trustees desired that this transfer should take place. Being appointed mainly with reference to their fitness to take the guardianship of the large number of boys at the institution under their charge, and not from any peculiar knowledge of farming possessed by them, they found that the proper management of so large a farm required far more attention than ought to be expected from any unpaid board of trustees.

The Board of Agriculture, on the other hand, desired facilities for conducting experiments on a small scale, by which they hoped to add something to the present stock of knowledge of farming, and to meet, in some degree, the wants of the farming community. It was not intended to turn the whole place into an experimental farm, or a model farm, or anything of the kind. The design was to manage the property in a plain, practical, farmer-like manner, and to subject only a small part of it to experiments of various kinds, which could be conducted there without expense to the Commonwealth, though some of them were of such a nature as to be beyond the means of individual enterprise. Under the influence of these considerations, both the trustees and the Board of Agriculture signed a petition to the legislature of 1854, to transfer the farm into the hands of the Board, and to appropriate the sum of six thousand dollars for permanent improvements and to meet the current expenses of the farm. This was the sum which in the opinion of the trustees would be required to make what permanent improvements were then greatly needed, and of this sum over four thousand dollars were devoted to such improvements.

This occupation of the farm, entered into after some deliberation, was, perhaps, a mistake. It made it necessary to apply to the legislature for appropriations outside of the legitimate objects of the Board in its organization, and as is always the case, subjected it to unjust criticism. The Board had to contend with prejudice, misrepresentation and falsehood, which seriously embarrassed the successful prosecution of a truly noble, practicable and judicious public enterprise.

The arrangement was one of true economy to the Commonwealth in every point of view, though it is always the case that property under the control of a number of persons,

even if they are sincerely anxious to make the most of it, is generally more expensive, and less productive, than where the whole power is lodged in a single individual, who is the sole owner, and on the economical management of which his prosperity depends. There is not so much feeling of personal responsibility, nor so much freedom and readiness of action. If there is to be consultation, conference and comparing of opinions before any step is taken, as there must be where the decision is to be made by a body of men and not by a single individual, time will be lost and delay will follow frequently, until the favorable moment has passed, and the thing to be done has either become impossible or can only be done at greater expense and to less advantage than at first.

But the object of the State, when it made arrangements for the management of the farm, were not precisely the same as an individual proposes to himself in a similar case. When a farmer buys a piece of land and undertakes to cultivate it, he starts with the determination, generally, of making it as profitable as possible in a pecuniary point of view. If he be a man of large and liberal ideas, if he be *truly economical*, he will not grudge some expenditure on his fields which may at first be unproductive, if it will afterwards make a good return.

Nor was the reasoning with reference to the general management of corporate property of any force, since in no case would the State Farm be managed by an individual owner, it having been purchased, in part at least, by the fund established by the benevolent founder of the State Reform School.

An extensive series of experiments was undertaken through competent committees, with various breeds of cattle, with a great variety of fertilizers and many different crops, and these experiments were continued during the five years' lease of the farm, when the arrangement was discontinued by the mutual consent of the Board and the trustees.

In 1859 the cattle disease known as the contagious pleuropneumonia was imported from abroad and introduced among our stock, at a time when its fatal and contagious character was little known, and if it had done nothing else for the State and the country beside the complete extirpation of that dreadful scourge to agriculture, wherever it exists, it would have paid all the expense of its organization many times over.

That the farmers of this Commonwealth are not to-day suffering from the constant dread and the actual visitation of this worst of all forms of contagious diseases among cattle, because the most insidious, is due almost wholly to the existence and persistent efforts of the Board at the time of its outbreak in this and subsequent years. And if it had not been for such efforts, we should now in all probability be subjected to a loss of many thousand dollars a year, with no reasonable hope of permanent relief from a tax upon our resources and our patience, the most severe and most difficult to be borne of any that could be imposed upon an agricultural community. The present existence and terrible ravages of this disease in England and other civilized countries, where it has become a fixture, causing immense losses every year, and increasing the hazards of stock-farming manifold, is a sufficient proof of the truth of this assertion.

The plan of holding country meetings for popular and scientific lectures and discussions was adopted by the Board in 1864, and met with so much favor among the people that it has been continued ever since, and is believed to have been productive of much good. In accordance with this plan most parts of the State have been visited in turn, while the meetings have been largely attended, and the lectures and discussions have constituted a leading and important feature of the reports, where they have been extensively read.

It was through the efforts of the State Board, also, that an inspection of fertilizers was established, and the present efficient inspector was appointed by the Board, at first as state agricultural chemist. The legislature of Massachusetts, in 1874, enacted a law which requires every manufacturer or importer of commercial fertilizers to take out a license at the office of the Secretary of the Commonwealth, paying therefor fifty dollars annually for each kind of fertilizer offered for sale, at the same time filing with the Secretary of the State Board of Agriculture, a paper giving the names of his principal agents, and the name and composition of the fertilizer made or imported by him. This law has already effected a great change in the general character of fertilizers offered in our markets, and greatly increased the confidence of the farming

community in the value of these substances, and the honesty with which they are made.

That the record of this department, during the past twenty-four years of its existence, has been alike honorable and useful to the Commonwealth, no one who has any intelligence of its operations, and the service it has rendered to the farming community, can for a moment entertain a reasonable doubt. It has awakened a wide-spread spirit of inquiry and a desire for improvement never known before among our people; it has collected and distributed a vast body of information which has come to be appreciated and universally sought for, and has issued twenty-three volumes of reports which are everywhere admitted to bear comparison with the best reports of the kind published in the country.

CHARLES L. FLINT,

Secretary of the State Board of Agriculture.

Boston, January, 1876.

APPENDIX.

REPORTS OF DELEGATES

APPOINTED TO VISIT THE

AGRICULTURAL EXHIBITIONS.

ESSEX.

The Essex Agricultural Society held its fifty-fifth annual fair, September 28 and 29, in the good old town of Danvers.

The programme was so well arranged and divided, as to give nearly equal interest to each day, and prove attractive to every class of citizens.

The cattle-show was on the Riding Park, which is owned by another society, in another interest than the Essex Agricultural Society, but its use was courteously extended for the occasion, and afforded ample space and facility.

The exhibition of neat-stock was large and of good quality, with a good admixture of pure blood; in all, 118 head. There were awarded for these, including premiums for town teams, $455. A few sheep were on exhibition, and 19 swine of good quality. Fifty-nine coops of poultry were displayed in a large tent, which also contained a good assortment of tools, carriages, etc.

There was a much larger display of horses than I expected to see in this part of the State, especially brood mares and colts. Ninety-four were on exhibition in the various classes, and $309 were awarded in premiums, which included $45 paid for horses in town teams.

Danvers exhibited 22 yokes of oxen as a town team, Topsfield 20, and North Andover 12. There were two-horse teams, one of four, and one of eight spans.

The trial of draught animals was in the afternoon of the first day, on the highway outside the park. There were 16 entries of oxen and steers, 16 of single horses, and 10 pairs of horses. The hard,

smooth road was well calculated to exhibit the strength of the teams and the skill of the drivers. A good degree of interest was manifested by a large crowd of spectators.

The ploughing-match on Wednesday, the second day, was also outside the park, on ground admirably adapted to the purpose of ploughing. It was on a beautiful hillside slope, affording a fine view of the operation to the great crowd of spectators. Five double and four single teams, nine of horses, four with swivel-ploughs, and four driven by boys, took part in the contest. There was awarded in all for ploughing the noble sum of $186. Fifty dollars of this sum was awarded in three premiums for boy-ploughing, understood to be presented by the President, General Sutton.

The annual address was by Rev. E. C. Bolles, of Salem. Subject: "The farmer's control of the forces of nature which work for him. Science and the practical are not in conflict."

The dinner, and short speeches after it, were enjoyed by nearly 500 persons, all the more sociable and enjoyable for the chilly fog and rain outside.

The noble building and grounds of the Peabody Institute were occupied by a busy crowd. The large hall was well filled with fruits, flowers and fancy articles. A large tent, which was connected with the hall by a rear entrance, contained a splendid collection of seeds and other garden and farm products.

I wish here to speak of the courtesy and efficiency of the officers of the Society. Large experience and ability are brought to bear, and the hearty coöperation of all, united in affording an entertainment of a high order, and insuring, it may be too much to say complete, but at least great success.

The remark was often made during the fair, "This is the best we have ever had." It was indeed a great success, and a credit to all concerned.

In closing this report, we would say that much attention was given to a portrait of Hon. Timothy Pickering, which was conspicuous in the hall. He was one of the founders of the Essex Agricultural Society, in 1818, and was its first, and for ten consecutive years, its President. As we looked upon the venerable form, and saw the people and the smiling faces of old Essex, we were constrained to say in the language of another, "If you seek their monuments, look around you."

C. Sanderson.

MIDDLESEX.

Your delegate arrived upon the grounds of the Society to which he had been assigned at an early hour on the first day of the exhibition, or, perhaps, it would be preferable to say, when the Society was getting matters arranged, and he was surprised to find so much interest manifested that the fair should be a success. With its finely laid-out grounds, and buildings so admirably adapted for the various uses, there seemed to be no reason why the exhibition should not compare favorably with that of other societies, and be a source of pleasure and benefit to all its members and visitors. Having the pleasure of a personal acquaintance with the president, Mr. Cummings, and Mr. Moore, he had no difficulty in finding the proper persons with whom to communicate. Had it not been so, he would have been at a loss, for here, as at some other fairs he has attended, there was no visible sign as to the official status of anybody, and whom to talk to, a fault which simple badges could remedy.

The view in the exhibition-hall was perfectly magnificent. Now, this word is used with a full knowledge of its meaning. We speak of the magnificence of a Roman triumph, or the greatness and splendor of some parade; but what more beautiful sight can there be than man's victory in the agricultural field? Compare the vegetables, contributed by President Cummings and others to the Middlesex exhibition with the spontaneous productions of the field, and then I think any one will say the show was magnificent. And your delegate wishes that time and space would allow him to name all those who, by their productions, gave so much pleasure to his eye. It was evident there were no "small potatoes" among the vegetable raisers of Middlesex.

But man cannot live by vegetables alone. While food for the body is good, there is equal necessity for nutriment for the mind, conveyed through the eye, and here, too, were we fed; for throughout the hall, flowers gratified your delegate with their beauties of form and color, and while the more gaudy of the cultivated plants held up their heads under the admiring gaze of lookers-on, the simple flowers that "adorn our roadsides, meadows and woodlands" were not passed by, but held their own with their society neighbors. Your delegate was so enraptured with the "show" in the hall, that his time only allowed him to give a hasty look at the pens filled with admirable stock; and he left the grounds with the thought that Middlesex was not a whit behind other societies in zeal for success, which, had the elements been propitious, would have rewarded the efforts of its members.

John A. Hawes.

MIDDLESEX NORTH.

I attended the fair of this Society on its first day, but was unexpectedly detained in Boston by professional calls upon the second and grand day of the exhibition. The first day was, unfortunately, very rainy, so that little could be done or exhibited out of doors; and the expected crowd was almost entirely detained from the show. Here were fine grounds, a very fair assemblage of cattle, and apparently every preparation made for a show sufficient to accommodate the New England Society. But the stock were shut up in their sheds and stalls, and the grounds exhibited a dreary show of empty benches.

But the spirit of the officers and members of the Society was not dampened; and within the building was the finest show of vegetables, with one exception, that I ever witnessed.

The annual meeting of the Society disclosed the fact that by some misunderstanding or mistake the fair of this Society, and that of the Middlesex, at Concord, came on the same week, and even happened upon the same days.

It was stated that much inconvenience was thereby experienced; and also that the Middlesex Society held the fair upon a day not allowed by law. Your delegate gives no opinion upon this question, because the facts are not known to him, but deems it his duty to report the facts, so far as known, and the complaints, for the consideration of this Board.

On Thursday, the second day, the weather was fine, and your delegate is informed that the fair was largely attended. More than three hundred persons attended the dinner, at which Hon. John A. Goodwin, president-elect of the Society, delivered an address, and was followed by other distinguished speakers, who greatly contributed to the final success of a most interesting show.

CHAS. G. DAVIS.

MIDDLESEX SOUTH.

I attended the exhibition of the Middlesex South Society, held on the 21st and 22d of September, and was present during the greater part of the two days.

A rapid survey showed me commodious grounds, well laid out, and convenient for the purpose of an agricultural show. One noticeable feature was the ample provision made for the care of stock while on exhibition.

A long line of covered stalls extended the entire length of one end of the grounds, and these were all occupied, either by cattle, mostly grades, or by horses, exhibited otherwise than on the track.

At right angles with these, and near one side of the grounds, extended another line of double stalls, facing each other, with roomy lofts well filled with hay. These stalls were filled with pure-bred stock, most of which belonged to the Ayrshire and Jersey breeds, with a sprinkling of Dutch and Guernsey. Judging from the entries and the stock present, pure-breeds take the lead in this Society, thus showing that its individual members see the wisdom of availing themselves of knowledge and skill that generations of experience have concentrated in our pure-breeds.

Directly opposite these double stalls, and quite to the other side of the field, a line of low sheds, several hundred feet in length, accommodated the swine, and a hundred feet of hastily constructed new pens showed an unusual number of entries, much beyond the expectation of the officers of the Society. At the other end of the grounds, opposite the first-mentioned cattle-pens, are stalls for all the horses exhibited upon the track, and for roominess, comfort and convenience, I have not seen them excelled. I mention thus particularly the arrangements for the comfortable accommodation and feeding of stock brought for exhibition, because it seems worthy of mention, and indicates the character of the men who manage the interests of this Society.

I will add, in this connection, that in consideration of this provision for the care and feeding of animals, this Society very properly requires all stock to remain upon the grounds during the two days of exhibition. Thus the substantial part of the show can be seen upon either day of the fair.

By this arrangement the Society, so far as its action is concerned, seems to have placed the cattle and horse interest upon an absolute equality, and in the progress of the show this attitude seems to be well maintained.

The basement of the hall was devoted to the show of poultry. The light Brahmas were the favorite breed, judging from the comparative number presented, and certainly one could not look upon those magnificent chickens without astonishment at their wonderful growth.

The show in the hall was admirably arranged, not deficient in quantity, but excellent in quality. I could but notice the care in selecting perfect specimens, especially among the vegetables. Few abnormal growths were seen, but there was a very satisfactory exhibition, in all the departments of the hall, of carefully cultivated and selected specimens, showing that the growers had a perfect

type in mind, and were cultivating in reference to this type. Therefore, though I may have seen at our local fairs larger collections of the produce of garden and field, I have not seen a better one than was on exhibition by this Society. I was also exceedingly interested in a basket of corn which the Sturtevant Brothers presented as a specimen of a crop of seven acres raised by them according to the formula of Prof. Stockbridge of the Agricultural College.

As I understand, this experiment, with several others, is to be carefully elaborated and published in the Transactions of this Society, I will add nothing more, save the statement, that a Society which becomes the medium of publishing the results of experiments so carefully, accurately and scientifically conducted from first to last, as I am sure these have been, becomes thereby a public benefactor.

The ploughing-match took place on the second day, at nine in the morning. Two classes of ploughs were used, the single and the double plough, and fine work was done by both, though the preference seemed to be in favor of the double plough. The motto, "not how much, but how well," seemed to govern the award of premiums. The exhibition of family horses, matched horses, roadsters and colts upon the track, occupied the time till dinner, which was handsomely served at half-past twelve o'clock, by a caterer from Worcester. Over three hundred persons occupied seats at the tables, and made themselves merry in disposing of the ample supply of edibles which had been provided.

After all were satisfied, President Johnson called the company to order, and introduced the speaking of the occasion by remarking upon the substantial success of the twenty-second annual exhibition of the Society, and alluding to the causes, mainly the hearty coöperation of members and officers. The speaking was continued by those present, in response to the call of the president, until half-past two, when the closing races of the fair commenced. This was the signal for leaving the tables, and they were as quickly abandoned as they had been filled two hours before. The general management of the affairs of this Society, as manifested in the show, seems worthy of special commendation, and the things suggesting criticism are not peculiar to the Middlesex South. The usual side-shows, whip and candy vendors, were in full force; tolerated only, I suppose, because they increase the revenue, which is a matter of no little importance to societies, which, like this, are still in debt.

Metcalf J. Smith.

WORCESTER.

It was fair to presume that at such an inland centre of business, where farming was in the ascendant, there would be found, at the proper time, a first-class agricultural show, and such the fifty-seventh of the series here proved to be. An aged resident, whose acquaintance I made on my way, was of the opinion that the show in Worcester, of late years, was not so good as when, in by-gone years, it was held in the town on the open common. When I came to see for myself, I could but think the gentleman was mistaken.

Worcester and vicinity are noted for cattle-raising, and notwithstanding the slight scare of the Texas cattle disease, there was an immense gathering together of neat hoofs, consisting of herds, and of less numbers, of all kinds, classes, and ages; and they were, in about all cases, fine specimens. The following are the names of the principal exhibitors, with the kinds and numbers shown by them: Of Ayrshires, B. F. and H. A. Harrington, of Worcester, had 25 head, and Bela J. Stone, of Westborough, had 13 head. Of Devons, Harvey Dodge, of Sutton, 12 head. Of Jerseys, W. T. Merrifield, of Worcester, had 29 head, and O. B. Hadwen, of Worcester, 20 head. Of Swiss cattle, Hall and Aldrich, of Worcester, had 16 head. Of Dutch, Luther G. Moore, of Worcester, had six head. Of native stock, E. G. Hewett, of Worcester, had five head. Of grade Devons, William Eames, of Worcester, had eight head. Of grade Shorthorns, John T. Ellsworth, of Barre, had five head; H. Barnes, of Worcester, five; and Luther Crawford, of New Braintree, had twelve head. Of course there were very many persons exhibiting in less numbers than those named. I was particularly pleased with the symmetrical form and uniform color of one of the herds of Jerseys,—O. B. Hadwen's,—consisting mainly of cows and heifers.

Among the cattle there were some thirty or forty yoke of splendid oxen, twenty pairs of which entered the contest in the ploughing-match. This work took place on the Society's grounds, at an early hour, on the first day, and was spiritedly and well performed. There were three horse teams engaged in it. There were on exhibition several pairs of trained steers, performing feats which, besides furnishing amusement, gave manifest evidence of intelligence in dumb animals. This was eminently a cattle-show.

There was a considerable show of swine, as to numbers, and they were of select breeds. Of sheep there were but few. Of poultry there was a good variety.

In the hall, the display of apples and pears was very fine, but

there was but little of other kinds of fruit. I learned that the Horticultural Fair, which was to come off in the city the following week, was the cause of a great withholding from this. The tables for vegetables were well loaded, and the household work and manufactured articles were in good proportions, showing taste and skill.

The public dinner was on the first day. The well-furnished tables in the upper hall, the able address of Col. Daniel Needham, orator of the day, and the presence of Governor Gaston, with his aids, and his timely and excellent address, were the noticeable features of the occasion.

The second was the great day for the display of horses, and the farmers from far and near availed themselves of their opportunity. Animals of this species, of almost all classes, were there: the brood mares with their colts, in great array, the progenitors, and the kings and queens of the race-course. Among the numerous spans in carriages was one of Clydesdale horses, brought from Canada, owned and driven by John Barry. They were of a peculiarly compact mould, extra fine for farmers' uses. The afternoon was the time of special excitement; people of the city and neighboring towns turning out in large numbers to witness the races. The weather on both days was chilly, but fine, which last contributed not only to the pleasure of the people in attendance, but also to the financial success of the Society. The interest taken in this fair and show was great. President Fayerweather, Secretary Eastabrook, the committee of arrangements, including our friend Hadwen of this Board, and the chief marshal, Shumway, and his aids, were all indefatigable in their various departments of work, and extended every courtesy to your delegate. Awarding committees were very prompt, and indeed the members in general took a lively interest in the objects of the gathering. After dinner the second day, the reports of awarding committees in readiness, were read and acted upon by the Society. A few were referred to the trustees for consideration and final action.

What adds greatly to the interest of the Worcester fair is, that many persons, members of other societies in the county, still retain their membership here, and attend, and compete for premiums and awards in the mother institution. It is doubtful if there be another county in the country in which there are so many agricultural fairs as in that of Worcester. For besides the five societies grown from the Worcester, recognized by and receiving the bounty of the State, there are ten town fairs, making sixteen in all, and richly entitling he mother of all the rest, at Worcester, to sit as queen.

HEBRON VINCENT.

WORCESTER WEST.

The annual exhibition of the Worcester West Agricultural Society was held at Barre on September 30 and October 1, 1875. The weather on the first day was cold and rainy, which prevented many from sending their usual contributions of stock and products to the show. But during the night the weather cleared, and early in the morning the roads were thronged with people and cattle on their way to the fair-grounds, so that by noon they presented an interesting and lively spectacle.

This Society has been famous for its good exhibitions, and although your delegate did not witness that of the first day, he has no hesitation in pronouncing the whole exhibition as creditable to the Society and honorable to the State. The Worcester West Society, as is well known, is situated in one of the most favored farming locations in the Commonwealth. It is renowned, also, for the enterprise and intelligence of its leaders and members, whereby it has achieved a well-earned reputation, not only in the State, but throughout New England.

We were, therefore, not surprised at the excellence of its exhibition. The president, Hon. Ginery Twichell, to whom the Society is greatly indebted for services and contributions, was early on the ground with his officers and marshals, determined that whatever "Old Probabilities" might state in the weather report, this Society, and the people who came to visit it, should have a good exhibition, and a pleasant and profitable occasion.

The exercises of the second day opened with the ploughing-match, on the inclosure inside the horse-track. There were nine ox and eight horse teams which entered the lists for competition. The work was well done, considering that the land was underlaid with cobble-stones and coarse gravel, and what added much to the excellence of the work was the quiet, gentle manner in which the ploughmen managed their teams. And right here, in the language of another, let me say, "As ploughing lies at the very foundation of all successful culture, is it not a great mistake that the reports of committees on ploughing are generally so meagre?"

This thought is suggested from the fact that these reports, unless they are accompanied with some description of the kind of ploughs used, and their effect on the soil, can be of little use except as a memorandum of the names of successful competitors.

The cattle on exhibition were numerous, especially those for dairy purposes. This region has been distinguished for its dairy products for the last half of a century, and of course prominent in the stock

department were to be seen many of the finest cows for dairy purposes that can be found in the country. One herd from New Braintree consisted of eleven cows of the Ayrshire breed, the mother or grandmother of which is now twenty years old, and was yielding in the month of September, four months from calving, forty pounds of milk per day.

There were about 20 head of fat cattle, embracing oxen, steers and cows, all of good character.

There were more than 90 milch cows on exhibition. Many of these were pure-bred animals, and most of them appeared to have been selected with careful reference to the production of milk, and their adaptation to that region of the State. Among those who had valuable herds of dairy or breeding stock may be named Messrs. John T. Ellsworth, A. H. Holland, Robinson & Lane, T. S. Hambleton, J. W. Mowry, and Peter Harwood, of Barre; N. B. Reed and John Brooks, of Princeton; L. E. Hill of North Brookfield; and Luther Crawford and W. A. Childs of New Braintree. But what interested me especially was Mr. Ellsworth's extensive herd of Shorthorns, as he started them on the road to the exhibition, and led to the remark that they would make a good "Cattle Show" of themselves.

The trial of working oxen and horses on loaded carts was said to have been highly creditable both to the animals and their drivers.

The exhibition of horses, in their various classes, was creditable to the Society. There were 13 entries in the class of colts; for single work-horses 14, and many at the trials of speed and races. The latter were not to come off until the next day. Mr. S. P. Twichell, of Framingham, exhibited his promising young stallion "Goldfinder," and there were several other noted horses that were to take the track in course.

There were some good sheep of the Cotswold and Leicester breed, and a good collection of breeding and fat hogs, and a fine litter of pigs, and a fair show of poultry.

Of butter and cheese there were a dozen boxes of the former and about fifty of the latter, including one weighing fifty pounds, presented to Governor Gaston, which the president, Mr. Twichell, wittily remarked, was on behalf of the ninety cows in the pens, and the hundred ladies at the tables. The samples of cheese were very handsome, and your delegate was happy to notice that the custom of former days in making cheese on the farm had not entirely gone by, even in the midst of the cheese factories so numerous in this region, about 75 cheeses having been seen in the room of Mr. Ellsworth who has all the modern appliances and conveniences for making good butter and cheese without regard to the changes of outside temperature. [Item.—For the purpose of record, the

writer may be permitted to state, that fifty years ago he was accustomed to exchange goods with the merchants of this region for new milk cheese at six cents per pound and two cents for skim milk.]

The show of vegetables was inferior to those offered at our exhibitions near Boston, but the display of fruit was excellent. The apples for which Barre and this section is so noted, were of extraordinary fine character, and although this was the non-bearing year, generally, yet here the trees were fully laden with their golden and ruddy fruit. The Gravensteins, Baldwins, Hubbardstons, Porters and others would compare favorably with any exhibition in the State. Some of the pears were also of marked excellence.

The flowers, ladies' work and the usual articles in the exhibition-hall, your delegate had not time to examine, being called from his labors to refreshment at the dinner-table in the upper hall. Here about four hundred ladies and gentlemen partook of an excellent repast. President Twichell presided, with marked ability and great humor, calling out Governor Gaston and other guests in a very playful manner. His Excellency made a most effective speech in advocacy of the cause of agriculture. Responses were made by Hon. F. F. Fay, ex-member of this Board, Col. Charles W. Wilder, of the governor's staff, and a poem, "Does Farming Pay?" by Henry S. Goodale, member of this Board, and your delegate, whom the president introduced as the orator invited twenty-five years ago to deliver the first address before the Society, but whom he had not been able to catch until the present time, and then and there demanded the service from him. This was complied with in a short and summary manner, expressing his obligations for the courtesies and respect shown him and his satisfaction with what he had seen and the pleasure he had experienced in his visit to the Society, and to this county, the home of his ancestors. He desires also to acknowledge with gratitude the attentions which he received from President Twichell and other friends, and especially from Mr. Ellsworth, for the opportunity of examining his model farm, and to his good lady, under whose hospitable roof he was so kindly cared for.

Marshall P. Wilder.

WORCESTER NORTH.

The duty of attending as delegate to the Worcester North was a very pleasant one. The weather was all that could be desired, and the exhibition in the various departments was well worthy of the study of the unusually large crowd that swarmed upon the grounds.

Among the noteworthy objects were fine Ayrshire, Jersey and Shorthorn cattle. Where so many fine specimens were to be seen, perhaps it is invidious to mention the beautiful Jersey stock of J. F. Brown, of Lunenburg.

An especial interest was manifested in the exhibition of poultry, and the show in this department was exceedingly fine. In the hall, the display of fruit was creditable, considering the year; that of vegetables was all that could be desired.

Perhaps the greatest attraction of the day was His Excellency, Governor Gaston, who made a good speech, which added much to the profit and pleasure of the occasion.

The officers seemed, under the influence of the bright day and multitudes of visitors, to take new courage in their work; so that your delegate could not help feeling that the exhibition was not only highly creditable to all concerned, but that it gave promise of great future success to the Worcester North.

P. A. Chadbourne.

WORCESTER NORTH-WEST.

The ninth annual cattle show and fair of the Society occurred at Athol, October 5 and 6. The Hampden Agricultural Society holding its exhibition in Springfield on the same days, your delegate was at a loss to manage to be in both places at the same time. The only compromise that seemed possible to make, under the circumstances, was to divide the time; I therefore attended our own fair on the first day, and that at Athol on the second day. From what I saw and learned, the fair was truly a grand success, notwithstanding the cold north-easter that raged all through the second day. The secretary reports the largest number of entries of any year; and the large attendance of from 3,000 to 4,000 people.

There was an exceedingly large show of poultry, over 50 coops, from 20 or more contributors. The show of sheep and swine was good, though not a large competition. The show in the hall was said to surpass the one a year ago. There certainly was an excellent display of fruit, considering that this was not the bearing year.

The spacious hall was literally crowded, though tastefully arranged, with the products of the farm and garden and dairy; with mechanic arts and fine arts and domestic manufacture.

The ploughing-match was participated in by three horse and one ox team.

Phillipston received the premium for the town team of 42 yoke, the only one entered.

The show of cattle, taken all in all, was one of the largest and best the Society ever had. The department of pure-breds seems to be on the increase. Shorthorns were entered by nine exhibitors; Ayrshires, none; Jerseys by seven competitors. N. B. Reed exhibited the only Devons,—three very fine animals, of perfect pedigree. The committee on pure-breds say, in their report, "While your committee were pleased to see so good a turnout in the Shorthorn class, they must say, that very few of the animals were up to the standard of what a Shorthorn should be." The breeders of Shorthorns in this section, and the committee from whom we quote the above, are probably aware that the Shorthorns cannot be raised to perfection on such sterile lands as generally abound in this part of the country, without receiving an extra amount of feed and care, such as but very few are willing, if able, to give them. The Shorthorns, to grow to perfection, require a large amount of rich food, and must have it handy. They will grow poor ranging for food in the pastures of most of our New England farms. Smaller breeds, with small bones, and compact forms, will thrive and grow fat on such lands, without this extra feed, when the Shorthorns, if left to themselves, would starve.

The kind of stock we consider best for the average New England farmer, are the Morgan horses, Devon cattle, Southdown sheep, Suffolk pigs and Dorking hens. The Society has divided the premium on milch cows into a class of cows for milk, and a class of cows for butter; this is as it should be. The supply of cows for our large towns comes from abroad, and their quality is depreciating, and for this reason it is best to encourage the raising of more and better cows, by enlarging the premiums and increasing the classes of cows and heifers.

H. M. Sessions.

WORCESTER SOUTH.

The annual fair of the Worcester South Agricultural Society, to which I was appointed delegate by this Board, was holden on the 9th and 10th of September.

On my arrival at the grounds, I was met by Daniel Dwight, Esq., member of this Board from that Society, who introduced me to the officers,—President, Nathaniel Upham, and A. C. Morse, Esq., Secretary,—by whom I was shown through the building and over the grounds of the Society.

I found the Society possessed of ample grounds, with a commodious building, the basement or first story of which is well fitted up with cooking-range, tables, chairs and other conveniences, for providing dinners for all, during each day of the exhibition. In the next story is the exhibition-hall, which was well filled with various articles, and above this a hall where all repaired after the dinner of the first day, and listened to short addresses from different members of the Society, and other gentlemen present, prominent among whom was our friend, Henry S. Goodale, Esq., who delivered a poem.

The exercises in the hall having been concluded, we took a more extended view of what was to be seen of the fair. There were sixteen teams of oxen and horses entered for the ploughing-match, which was the first thing on the programme, and which attracted a large crowd of interested persons. The ploughing was good; the horses and cattle were looking well. There was a good number of working oxen and steers, and some fine fat cattle. The Jersey, Ayrshire, Devon and Shorthorn were on exhibition in fair numbers, and some very good specimens of each breed.

Some very good sheep were exhibited. The show of poultry was small. Owing to the lateness of the season, and the early period of holding the fair, the display of garden vegetables, cereals, and the products of the farm, was not what it would have been some weeks later, although there was a fair showing of vegetables, including potatoes, turnips, squashes and melons, and some fine samples of grain.

There was a good show of bread, butter and cheese. The display of fruit was all that could be expected, it not being a "fruit year." The show of flowers and plants was very creditable.

In the department of needle and ornamental work was seen the usual display of skill and taste. One important feature of the fair on the first day was the exhibition of trained steers, which I think can be described in no more fitting language than that employed by one who, possessing in himself those qualities of mind and heart which distinguish "nature's nobleman," is ever quick to recognize and acknowledge these attributes whether shown in man or beast. I quote the words of the delegate to this Society in 1873, who says: "To one who never witnessed this beautiful sight, no true conception could be formed. It is simply an exhibition of the wonderful power of the human mind in sympathy with animal instinct, or in other words, the wonderful power of kindness. There can be no doubt that man has the power to impress his own character on that of his domestic animals; that he can inspire them with love and confidence, or with hatred and revenge, and it reacts on himself as

certainly as it does on the animal. To educate our domestic animals through the agency of love instead of fear, is the great lesson of the hour, and this was the lesson taught by the training of these steers."

The second day opened inauspiciously, and the rain greatly diminished the attendance. This was unfortunate, as the day had been set apart for the exhibition of the horse, that faithful servant whom the poet Cowper has called, "The noblest of the train that wait on man." There was the usual exhibition of carriage-horses, stallions, breeding-mares and colts. A large number of horses on the grounds possessed superior qualities, but the weather prevented a full exhibition of the same.

This Society has a debt of $5,000. Its debt was much larger, but is being reduced yearly.

I can but say that I found myself in the midst of a company of earnest workers, who seemed to have a true idea of the progress of agriculture, and to be doing their part to forward it; their kind attentions toward me prove that the graces of hospitality are as carefully cultivated as the products of the soil.

The Worcester South is a live, flourishing Society, doing credit to the State as well as to itself.

J. Ladd.

WORCESTER SOUTH–EAST.

The Worcester South-East Agricultural Society held its sixteenth exhibition at Milford, September 29 and 30, and October 1. I did not attend on the first day, and arrived a little too late on the second to see the ploughing-match, which was hotly contested by 30 teams—21 pairs of oxen, and nine pairs of horses. All who saw it pronounced it a splendid sight, and acknowledged that the work was admirably done. On returning to the fair grounds, the trial of working oxen and steers commenced, and was kept up nearly throughout the day. The trials were first made with a load on a cart, and were contested by 15 pairs eight-year-olds, and 12 pairs four-year-olds, all of which handled their load well, and a good number did it very handsomely, and apparently with perfect ease. We noticed that where the lash was least used, the work was done best; but as a rule we must give the teamsters credit for kindness to their oxen. Among the teamsters we noticed one man seventy-two years old, who drove his own team, a pair of fine five-year-old oxen, and we doubt if any oxen did their work better. On being questioned, he stated that he had attended every fair, except one, of the Worcester

County Society (56), and every fair of the Worcester South-East (16).

The trial of walking oxen was an interesting feature of the exhibition, and one worthy of imitation by other societies. Thirteen pairs were entered, and they showed themselves to good advantage; a pair of oxen that will walk quickly and upright are valuable, and we think that the improvement of the walking qualities in oxen and horses should have more attention. The town teams were very fine, attracting the attention of large numbers of spectators, and were a credit to the owners and the towns from whence they came.

A number of pairs of oxen and steers were so completely matched that it would be difficult for a person unused to them to tell them apart.

The exhibition of trained oxen and steers was the most interesting feature of the ox show, and one that attracted a large crowd. They were exhibited without a yoke, changing sides, one walking backwards and the other forwards in the same direction, at the same time getting on to their knees and walking, lying down, and getting up, resting their forward feet on a saw-horse, carrying their driver on their back, and putting their forward feet into a cart. A son of Mr. Perry Wood, of Mendon, thirteen years old, manifested great skill in the management of a pair of steers twenty-seven months old.

Mr. F. L. Stockwell, of Sutton, exhibited two pairs of steers six months and sixteen months old, which went handsomely through the changes, backing and walking on their knees like oxen.

H. M. Taft, of Uxbridge, Ely and Lewis Bates, of Mendon, and other young men, whose names I did not learn, manifested great skill in the management of oxen and steers.

Farmers and all managers of dumb animals, especially the managers of the horse, might learn a lesson from these steers. It was plain to be seen, that while they were made to obey, they were not abused, or made afraid of their masters. All the oxen and steers seemed perfectly at ease surrounded with a crowd of strangers.

It was a pleasant sight, worthy of note, to see the farmers with from one to three sons assisting in the management of the oxen and steers, showing that all farmers' sons do not leave the farm for the store or office; and we do not see any better countenances for honesty, health, uprightness and energy, than we saw among these young farmers.

The exhibition of horses was good, and justly drew a large crowd.

The pens were well filled with the varieties of stock, and the society and the owners may feel justly proud of the dairy stock contained in their pens.

The spacious hall contained a good display of vegetables, fruits,

manufactured articles, and machinery of various kinds, and with the handiwork of the ladies, beautifully arranged and beautifully made; there were also some very fine specimens of wax and needle work covering the entire sides of the hall.

My visit will long be remembered with gratitude to the officers and members of the society, for their kind attentions, and especially to Mr. Wm. Knowlton, of Upton, who took me to his pleasant home, and made me doubly welcome. He not only took me, but bade the farmers who passed his place with their teams returning home, a hearty welcome to his boarding-house and stables.

ELIJAH PERRY.

HAMPSHIRE.

As it is the custom to remove the stock at the close of the first day, we were unable to witness this interesting feature of the exhibition. We are pleased to learn, however, that it was one of the best the society has ever made. In a very full report which appeared in the "Springfield Republican," we find the following:—

"The Hampshire Agricultural Society began its twenty-sixth annual festival at Amherst, yesterday, with remarkable success. Everything seemed propitious, the weather and the Agricultural College included, and they had a first-class show. There were 60 entries of cows, and a large array of bulls and thorough bred cattle. About 30 yoke of oxen formed the town teams of Amherst and Hadley. They were mostly grade Durham, and some of the heavier pairs reached 3,800 pounds. The Agricultural College fairly unbosomed itself, sending as its contribution: 18 Shorthorns, 13 Ayrshires, five Jerseys, two Dutch, and two Brittanies—40 head in all; besides seven Cotswold sheep, four hogs of the Berkshire, Chester, or Yorkshire breeds, rabbits, ducks, turkeys, peacocks, hens, pigeons, vegetables, and 90 varieties of potatoes."

Dr. Edward Hitchcock, delivered the annual address on "Some of the Poisons of the Farmer's Life"; among which he classed "pork, the diseased adipose matter of the American hog." This he characterized as "the happy nest of trichina and tape-worm," and believed the best use of pork would be, "to cut it into inch pieces and feed it to grape-vines, currant and gooseberry bushes," and have more fruit and less pork. His address was said to be "sharp, sensible and suggestive."

The morning of the second day opened lowery, and soon the rain fell in copious effusions, continuing during the forenoon. We arrived at the hall at 11 A. M., and found a very good display of

useful and fancy articles, fruits, flowers, vegetables, etc. Very few persons were present.

At noon, dinner was furnished in the upper hall at about half the price of cattle-show dinners in the eastern part of the State. We queried how so good a meal could be furnished at so low a price.

In the afternoon the several trials of horses took place, although the condition of the track and the surroundings were very unfavorable for such exhibition. We are pleased to learn that, despite the adverse circumstances, the receipts of the fair were nearly sufficient to cover the expense.

Geo. W. Baker.

HIGHLAND.

I had the pleasure of attending the annual cattle-show and fair of the Middlefield Society. It is surprising to a valley man to see all the usual triumphs of the husbandman displayed on the mountains. The show of cattle was good; and there were some fine specimens of breeding stock. Few herds can show animals equal to Mr. William Blush's Alderney bull. The ploughing-match exhibited great skill and success in this important branch of agriculture. There was a very exciting contest to test the strength of working-oxen. The Horticultural Hall was amply furnished. The specimens of vegetables proved that the gardens are well attended to on these hills. Apples, pears, and other fruits reminded one of the great fruit exhibitions of the eastern counties. Careful observation of the various features of the fair satisfies one that the society accomplishes much good for this very interesting locality. The visitor need never weary, for when he has looked upon the show till his eye tires, he has but to survey the wonderful panorama of natural scenery around him, and he will be abundantly refreshed.

E. H. Kellogg.

HAMPDEN.

The annual fair of this Society was held at Hampden Park, Springfield, October 5 and 6. The attendance on the first day, the "cattle-show," was quite small, as it seemed to me, considering the favorable day, the place, and the fact that the Society make no charge for admission to their grounds on the first day of their exhibition. A regular attendant characterizes the occasion as an "unpretentious, pleasant time."

There was a fair exhibit of dairy-stock of all ages, as to numbers, much of it very good, a large proportion being pure-breds, and representing most of the different breeds.

It was noticeable that most of the stock was offered by a few well-known breeders. Among the noted herds were the Shorthorns of P. Stedman & Son, of Chicopee, and Wm. R. Sessions, of Wilbraham; the condition of both herds indicating that their owners regarded usefulness more than pampered beauty. The Ayrshires of Wm. Birnie, of Springfield, the Jerseys of J. L. McKinstry, of Chicopee, and the Devons of H. M. Sessions, of Wilbraham, attracted much attention. Much regret was expressed that the fine herd of Devons of Wm. Mattoon, of Springfield, was not on exhibition.

The show of bulls was not large, but there were a few very good animals. J. L. Shepard, S. W. Mosely and Ethan Brooks, had some grade cows which were evidently deep milkers. Mr. Wm. Pynchon, president of the society, set an example, worthy of imitation by officers of all agricultural societies, by offering the best cow upon the ground, tested by the pail. Her owner stated that she gave thirty quarts of milk per day, from May 12 to July 1 and from that time to October 1, twenty-three quarts per day, on the average. This cow was a grade.

The show of fat cattle and working-oxen was not large, nor remarkable for quality, and the same remark is especially applicable to that of sheep and swine.

A pair of trained steers by G. W. Morgan, of Belchertown, attracted much attention. Such exhibitions should be more common at our fairs, and deserve all the encouragement that can be given. The trainer and the animals are each improved by the discipline they mutually receive, and the spectators cannot fail to get a higher and better appreciation of the nature and intelligence of the brute.

Of poultry there was a fair show, the largest exhibitor being Alfred Birnie, of Springfield.

There was about the usual display of agricultural implements. Messrs. B. & J. W. Belcher exhibited a new swivel-plough, a novelty of which consisted in the mould-board being in two parts. In changing from one side to the other, the point end went under in the old way, and the other part went over the beam. By this arrangement a more perfect mould-board is secured, but it necessitates a considerable increase in the weight of the plough. It was a matter of regret that there was no p'oughing-match, by which the merits of this or any other plough could be determined.

The display of fruit at the city hall was large and attractive, embracing most of the kinds and varieties grown in this section.

This part of the exhibition appeared to be the most complete of any. There was also an abundance of vegetables, and of good quality.

Of butter there were eleven entries, some of it choice. The few cheeses shown were fair, though not equal to those offered at some other exhibitions.

Among the "fancy and domestic" articles were many things indicating taste and skill; though, perhaps, hardly enough to fairly represent a community so favored in wealth, culture and refinement as this.

Your delegate did not stay to witness the "horse-show" on the second day, taking it for granted that the Board would believe that this part of the exhibition would be satisfactory to all concerned.

In conclusion, we desire to refer to one matter which would seem to be worth consideration by this society and others; viz., the limited time that animals are kept on exhibition. We noticed that many were not on the grounds until after ten o'clock, and that some were driven away before two o'clock. The State, and public-spirited persons in establishing agricultural societies, undoubtedly intended not only to encourage effort by offering premiums, but to furnish also a favorable and sufficient opportunity for all to make careful and critical examinations and comparisons of whatever might be presented. To Mr. Pynchon, and Mr. Bagg, president and secretary of the society, and to Hon. Henry Alexander, Jr., your delegate is under many obligations for courteous attention.

A. H. Holland.

EASTERN HAMPDEN.

The twenty-third annual exhibition of the Eastern Hampden Agricultural Society occurred on Thursday and Friday, September 23 and 24, two as cold mornings as were ever experienced in this section so early in the season, the frost being so severe in many sections, that tons of grapes and bushels of peaches were entirely destroyed. On Saturday morning, your delegate found in his own young peach-orchard of three hundred trees, what would have filled over fifty crates, of worthless, frost-bitten peaches.

Mr. A. M. Myrick, the delegate appointed, not being present, I was requested by the president, Dr. Wakefield, to report to this Board.

Having taken no notes of the first day's exhibition for this purpose, I am obliged to refer to the society's books for facts and

figures. I have a general impression of the success of the show, from having been present as an interested competitor, with twenty head of Devon cattle, Morrill colts, Cotswold sheep and Dorking chicks, and a large collection of apples in the hall.

In all departments this was the best show the society has had for several years. There was a lively competition at the ploughing-match, which came first on the programme, with twelve entries,—seven ox and five horse teams. The ploughing was creditable, considering the nature of the subsoil, which was very stony.

There were over 250 animals on the park. The State Primary School was represented by 63 head, mostly cows, including 25 head of pure-bred Ayrshires. Among the ten cows entered as a herd of milch cows from this institution, was one twelve years old, that has given 7,980 pounds of milk the past year, and over 25 tons of milk in seven years. There were eight entries of herds of neat-stock, and 59 of cows and heifers, the show of cows being unusually fine. Also large representation of oxen and steers, with a few flocks of sheep, and pens of swine, and coops of poultry. The show of thorough-bred stock is increasing in the society.

Besides the 55 head of Devons and Ayrshires, the Shorthorns and Alderneys had a few representatives. Among the grades, the Durhams predominated.

The hall was well filled with an unusually fine display of fancy goods, fruits, flowers and vegetables.

Horace Wallis, Jr., of Holland, one of the society's directors, exhibited a 121 pound squash, grown since August 1, from the seed of President Clark's Mammoth Lifter, at the rate of over $2\frac{1}{4}$ pounds per day. Every department in the hall was represented. The show of bread, butter and cheese, though small, was of excellent quality. The exhibition of fruit was very fine considering the short crop.

Besides the ploughing-match the first day, there was the exhibition of working-oxen attached to a loaded cart, of walking-oxen around the track, and trained steers.

The committee on milch cows came to the subscriber with the inquiry, "What constitutes the best milch cow?" We told them at once, that the class should be divided, into, "cows for butter," and "cows for milk." We think the societies generally should increase the classes and premiums on milch cows and heifers, to encourage the raising of more and better cows. The exhibition of horses the second day was of about the usual interest and display.

H. M. Sessions.

UNION.

The tenth annual exhibition of the Union Agricultural Society was held at Blandford, on the 22d and 23d of September last.

The country in and about Blandford is rough, high and mountainous, but nevertheless is rich in grazing and grass-growing lands.

The farmers, aware of this fact, make the most of their situation, by devoting a great deal of attention to raising and fitting cattle for the markets, which they find in the towns on the Connecticut River.

The exhibition was literally a cattle-show. Early on the 22d, the cattle began to come into the fair-ground. There were Alderneys, Ayrshires, Devons, Durhams, Herefords and natives,— some two hundred in all. A very large proportion of these cattle were young, growing, thrifty, well-trained oxen, and promising steers. In the first class, the oxen of the Nyes were prominent. In the latter, W. H. Hawley, of Sandisfield, and Messrs J. D. Ripley & Son, of Granville, presented steers which would be a credit to any state exhibition.

The animal which attracted the most attention was the Alderney bull "Emperor," a large, well-formed, sleek-haired, bright eyed, representative of his race, apparently as active and as lithesome as a tiger. It was the property of H. E. Knox.

In the afternoon there was a trial of working-oxen, in which the spectators were exceedingly interested. The drivers and the cattle performed the work assigned them in a satisfactory manner.

After the exhibition of the oxen, the Rev. A. L. Loveland, of Connecticut, delivered in the Congregational Church, a sensible, practical address to the farmer, his main subject, "The Soils, and How Improved." The speaker was complimented by the very close attention he received.

In the evening there was a gathering of the members of the Society in the church, and various subjects of interest to the farming community were discussed by the orator of the day, E. W. Boise, Dr. Stratton, of Lee, and others.

The second day was devoted to the exhibition of horses. At an early hour the track was well filled with horses of all descriptions; work-horses, driving-horses, family-horses, and fast horses were represented; conspicuous among all was a fine dark bay stallion, owned by F. C. Knox.

The horses as well as the oxen appeared to be well cared for, and it is with pleasure I am able to state that I saw no animal abused while at the fair.

Inside the hall the exhibition of fruit, flowers, and vegetables, was fair, some specimens of apples being remarkably good. There were huge squashes which the spectator readily believed must early have attained to such vigorous growth as to defy any harness the ingenuity of President Clark might apply.

Articles of needle-work, knitting-work, wax-work, products of the dairy, jellies, preserves, etc., were abundant, and showed plainly that the women of Blandford "ate not the bread of idleness."

This society is gradually reducing its small debt, and, at the same time, improving its grounds and buildings, and it deserves and appreciates the encouragement which the State affords.

STEPHEN SHEPLEY.

FRANKLIN.

The twenty-sixth annual fair of the Franklin County Agricultural Society was held at Greenfield, September 30 and October 1, 1875. It was one of the best fairs your delegate ever attended.

Thursday morning the weather was very unfavorable. A cold north-east storm set in, and promised to hold good for a week.

But about 9 o'clock, the clouds which overcast the sky cleared a little, and there were indications of a pleasant day. But by this time the people had formed their plans, and had decided to postpone their visit to the fair until the next day; consequently, the number in attendance was smaller than it otherwise would have been.

There was, however, no backing out among the exhibitors of stock.

The cattle, sheep and swine, that were brought to the grounds in spite of the weather, were a sight to behold.

Old men, young men, and boys, all seemed interested to get their stock ready for exhibition.

There were twelve herds of stock entered, comprising some of the best neat-stock in the State.

The herd of Shorthorns exhibited by John S. Anderson, of Shelburne, was worthy of particular notice. There were twenty-six head entered by him, including one pair of four-year-old oxen, that weighed 4,700 pounds, the heaviest yoke of cattle on the ground. Another yoke of 4,200 pounds, another of 3,700 pounds, and still another 3,670 pounds.

Two pairs of two-year-old steers, 3,200 and 3,300 pounds, respectively: two two-year-old heifers, weighing 1,250 and 1,350

pounds; four yearling heifers, averaging 1,100 pounds each; and six magnificent cows entered as milk and stock cows were exhibited.

But the king of the herd was "Scotchman, 2d," a pure-bred bull which Mr. Anderson imported recently from Canada. "Scotchman" tipped the scales at 2,400 pounds. He is a model animal. He also exhibited another fine animal, a three-year-old heifer, weighing 1,400 pounds, which he purchased in Canada.

One cow was exhibited with this herd descended from "Roan Duke," now owned by W. H. Bardwell, that makes twenty pounds of butter a week.

Lowell S. Brown, of Shelburne, exhibited a fine herd of 14 head, 11 of which were pure-bred Shorthorns, including his bull "Massachusetts," weighing 2,150 pounds.

G. W. Truesdell exhibited a herd of 20 superior animals, especially for the dairy.

Levi Smith, of Deerfield, exhibited a herd of 18, including his bull, "Young Prince,"—a model of beauty. A statement of the income from a dairy of nine cows, since the first of January last, contains the following:—

Butter sold,—1,575 pounds,	$566 64
Estimated amount used in family,	44 46
Milk fed to calves,	75 00
Milk fed to hogs,	50 00
Total,	$736 10

D. O. Fiske's herd of 20 made a very creditable show.

The exhibitors of Jerseys, and grade Jerseys, were H. C. Haskell, N. Farren, C. H. Child, Fred and Frank Kelly, all showing fine cattle. Several other herds did great credit to the show.

The number of Herefords, Ayrshires, and Devons on exhibition was small, though good in quality.

The farmers seem to be divided between the Shorthorns or large Durhams, and the butter-making Jerseys.

Two town teams of 17 yoke each were entered; viz., Shelburne and Deerfield. The average weight of the 34 yoke was nearly 4,000 pounds each yoke.

The trial of working-oxen was very good. Although the oxen did not seem to be so well trained as I have seen at other fairs, yet by their enormous weight, they were seemingly able to move any load they were attached to.

A large number of mammoth oxen were on exhibition, weighing from 3,500 to 4,700 pounds per yoke.

Besides these, there were steers three years old, two years old,

one year old, and steer calves, some twins, others not so nearly connected, yet equally well matched.

The number of cattle on exhibition was about 200 head.

Sheep made the best show, I was informed, ever seen upon the ground; every pen set apart for this class was filled. Among them were fine wool, middle wool, long wool, and sheep for the shambles, all very fine specimens. The greatest attraction among the sheep were those exhibited by S. H. Moody, of Northfield, purchased by his brother, D. L. Moody, the evangelist, in Birmingham, England. They were Shropshire Downs, one buck and two ewes, 18 months old. The ram was estimated to weigh 350 pounds, the ewes 125 pounds each. They were landed in Northfield one day previous to the exhibition. It was the opinion of your delegate, that better sheep than these never stood in Massachusetts.

Swine were also well represented. There were Chester Whites, Essex, and Poland China. All were superior in quality. One litter of seven, a cross between Poland China and Chester Whites, was a little ahead, averaging 45 pounds, six weeks old. A better display of swine is seldom seen at any fair in the State.

M. L. Hubbard, of Sunderland, showed nine pigs, half Suffolk, that ranked in the first class, average weight 45 pounds each.

The show of poultry was extensive, and good in quality. Fifty-six coops were on exhibition. Light Brahmas, Golden and Silver Hamburgs, Leghorns, and Plymouth Rocks, were the most numerous, while geese, turkeys, ducks and doves were not wanting to complete the department.

The exhibition in the hall, I was informed, has never been excelled on any former occasion. Nearly every department was fully represented. Certainly it was a grand display.

Great credit is due W. L. Warner, Esq., an efficient member of this Board, for his good taste in arranging the articles for exhibition, in such good order, that every article showed to the best advantage.

W. L. Warner was the leading exhibitor of garden vegetables, he entering 93 varieties. His seed-corn, enormous beets, potatoes, and 23 varieties of beans were particularly fine.

Among his collections was a corn-stalk fourteen feet eight inches in height; and Bela Kellogg, of Greenfield, presented one equally as high, if not higher, than the one exhibited by Mr. Warner.

An enormous stalk of hemp graced the corner, exhibited by George W. Mark, of Greenfield.

Louis Bane, of Deerfield, exhibited four squashes of tremendous growth; the weight was given. H. C. Haskell, exhibited one of 74 pounds; he had also sweet potatoes, and a variety of garden vegetables, that would be difficult to excel.

Hon. A. C. Parsons, of Northfield, had on exhibition samples of corn, raised on unproductive soil, using a fertilizer made on Prof. Stockbridge's formula for corn. If the Professor's production can do this every time, the fertilizer will be a good thing for more of our farmers to have.

Eighty-three varieties of fruit were exhibited by W. L. Warner, and a very fine lot they were.

The best display of grapes was that of Jacob Steigleder, comprising ten entries. Lewis Farrell and J. P. Howard were large contributors to this department.

Plums and pears were in abundance, and the varieties were numerous.

There were thirteen entries of collections of apples, showing some splendid specimens from the farmers' orchards. Mr. Buddington's statement of his orchard, containing ten acres, yielded,—

In 1870,	400	barrels.
1872,	300	"
1873,	225	"
1874,	225	"
1875 (estimated),	275	"
Total,	1,225	barrels.

There were 24 entries of wheat bread, four of rye, seven of brown, and four of graham.

There were 21 entries of butter, and statements of the method of making the same, which were creditable to the ladies of this county.

The show of cheese was not extensive, but very fine in quality.

Of fancy articles, there were some 200 entries. Of domestic manufactures, 43 entries. Miss Mary Tighe exhibited a beautiful worsted picture, in which, as was stated, there were set 144,555 stitches. I did not count them, but no doubt the statement was correct.

The hall was opened Thursday evening, and was thronged with visitors. The Greenfield band furnished the music, and the occasion was greatly enjoyed by all.

Friday, the second and last day of the fair, was expected to be the great day of the occasion. But the clouds, that had dispersed to permit the success of Thursday, gathered again during the night, and on Friday morning there was a cold north-east rainstorm, which steadily increased during the whole day. This was certainly very discouraging to the friends of the Franklin County Society. But at about eight o'clock the horsemen began to gather

on the park with their stock horses, brood mares and colts, of all ages, until the pens and sheds were all full, and a better show of horses and colts is seldom seen. There was no especial exhibition of speed, as their park is not convenient for a track.

A large number of good three-year-old colts, weighing from 900 pounds to 1,200 pounds, were on exhibition. Two-year-old colts, of good points, were also there; also yearling colts of great promise. Of suckling colts, there were 20 entries, and a better show of colts your delegate never saw.

The programme announced the time of dinner to be at half-past 12, but on account of the storm it was thought best to put through the committees on the different classes of horses, and take dinner afterwards. The dinner was furnished by the ladies of the Second Congregational Church. The tables were well spread, the food abundant, and particularly well served. After full justice had been done, President Brown made some congratulatory remarks, and introduced distinguished guests from abroad, who made short, practical speeches. This was a very interesting feature of the fair, and, on the whole, it was a very enjoyable occasion.

Financially this society is independent, free from debt, and owning a beautiful park, consisting of about ten acres. It is one of the oldest societies in the State.

Being thus situated, they are not easily embarrassed, although their receipts at the gate this year must necessarily have been very small. I am informed that they realized both days, only about six hundred dollars.

Your delegate extends his thanks to the officers of this society for their attentions during his stay with them.

DANIEL DWIGHT.

DEERFIELD VALLEY.

The morning of the 23d of September opened fair and bright for the exhibition of this young and energetic society. The bracing air, holding its full share of oxygen, nerved alike the old and young to speed their way to the fair-grounds at Charlemont. These grounds are situated on a broad plateau, amid the hills, hundreds of feet above the river, and command one of the most beautiful and picturesque views of hill and valley to be found in this or any other country.

The farmers of the surrounding towns were here in good numbers, and it did not take long to establish in my mind that this was truly

an agricultural exhibition. The grounds were well filled with herds of all the approved breeds, and among them were many superior animals. There were a large number of fine working-oxen. Coleraine sent a town team of fifteen yoke, weighing in the aggregate 47,030 pounds. One yoke from Hawley weighed 4,190 pounds, and there were many others that crowded hard on to 4,000 pounds. The great feature of the exhibition was the sheep department. There were thirty-one entries in the various classes, numbering about four hundred. They were principally of the fine and middle w ol varieties, and were a rare exhibition for Massachusetts.

Swine were not very numerous, the Chester Whites predominating.

Poultry—Brahmas, Cochins, Leghorns, Houdans, and the beautiful gold and silver Hamburgs—laid claim to notice.

The show of fruit was respectable for the season. In passing along the river road from Shelburne Falls to Charlemont, I could but notice that in many places where the trees are protected from the cold-bearing north-west winds, they hung full of red-cheeked beauties, and I could but wonder at their not giving more attention to the raising of fruit. The virgin soil, washing down from the hills, gives the nutriment they most require.

Farm crops were most excellent, the bread, butter and cheese attesting to the fact.

Canned fruits in great variety were shown.

Of flowers, there was a very pretty collection, and the needle and pencil showed skill and industry.

After the dinner a novel sight presented itself. Several hundreds of people seated themselves on the grass, opposite to the speaker's stand, and listened attentively to the address given by Richard Lathers, Esq., of Pittsfield. It was an able effort, containing much valuable information for the farmers and hearers generally.

In the evening one of the vice-presidents gave a reception to the orator and members, and two hours were happily spent in speaking and social converse.

The second day seemed to vie with the first in its endeavors to make every one happy. The crowd was there to witness the exhibition of horses, and they were not disappointed. The grounds were filled with people, and stallions, and breeding-mares, and their progeny, of all ages and sizes, showing that the farmers are giving their attention to the more careful breeding of the horse. There were a large number of carriage-horses, single and in pairs, and none more worthy of notice than the *noble blacks*, belonging to our worthy associate on this Board.

That this Society is doing a good work, that it is meeting the

requirements of the State, and that its success is all its founders could reasonably expect, I cannot doubt. I should do injustice to this Board and my own feelings did I not acknowledge the universal respect shown them, through their delegate. Words cannot express my obligations to our associate and his devoted wife, for the true home comforts enjoyed at his fireside.

ELIPHALET STONE.

BERKSHIRE.

The sixty-sixth annual exhibition of the Berkshire Agricultural Society was held at Pittsfield, the 5th, 6th and 7th of October. It was late in the afternoon of the first day when I arrived, yet there was an opportunity for seeing some of the stock before it was removed from the grounds, it being their custom to exhibit neat-stock the first day only.

The weather was cool, but the attendance was good notwithstanding, and the exhibition was fully up to that of former years.

There were 48 entries of pure-bred neat-stock, consisting of bulls, 14; bull-calves, 5; breeding-cows, 14; heifers, 8; and other calves, 7. These consisted of Devons, Jerseys, Durhams, Ayrshires and Dutch.

Of grade animals there were 99 entries; viz., Fat cattle, 5; working oxen, 15; steers, 7; dairies, 5; milch cows, 21; breeding cows, 11; heifers, 18; calves, 7; herds, 10;—aggregating 147 entries of neat-stock, and numbering 256 animals. Noticeable among these was the Dutch cow, belonging to the West Pittsfield Shakers, which is milked three times a day. Owing to her great productiveness, $1,200 has already been refused for her.

There were 52 entries of sheep, consisting of rams, 19; ewes, 15; lambs, 11; fat sheep, 2; and 5 flocks; the whole numbering 230.

Fourteen entries of swine: Boars, 4; sows with pigs, 10; numbering 80 in all.

Of poultry there were 47 entries, as follows: Fowls, 35; ducks, 2; turkeys, 4; and geese, 6.

The second day was cold and damp, which, without doubt, kept many away who otherwise would have attended the exhibition of horses, which was unusually fine. There were 117 entries, consisting of matched horses, 18; single horses, 21; stallions and studs, 12; mares with colts, 17; colts, 46; and trotters, 3.

The exhibition-hall was well filled with the usual variety of household, mechanical and field productions, there being 484 entries of household manufactures, consisting of carpets, rugs, hosiery, embroidery, crochet-work, and many other articles both useful and ornamental.

Of paintings and works of art, there were 116 entries, among which were many fine specimens of oil and water-color paintings, crayon and pencil drawings, photographs, wreaths, wax-work, marble statuary, etc.

The display of agricultural implements and mechanical productions consisted of 41 entries, embracing not only articles necessary for farming operations, but also for lessening the labor of household duties.

In the department of manufactures, there were 22 entries, among which were cloths from Hinsdale Brothers, harnesses by A. D. Gale, flour by R. A. Teeling, and a case of sewing-silk by the Saunders Silk Company, which attracted much attention.

The exhibition of field and garden vegetables consisted of 145 entries—Thomas Allen contributing 96 varieties, and James Burk 80.

Sixty entries of seeds, consisting of corn, rye, barley, oats, buckwheat, beans, potatoes, spring wheat, pop-corn and timothy seed, were shown in packages of one bushel each.

Of fruits, there were 152 entries. Twenty-six varieties of apples were contributed by George P. Briggs of Pittsfield; 31 of pears by William G. Backus, 35 by C. T. Rathburne, 31 by S. W. Dow, of Lanesboro'; peaches by Zaccheus Cande; quinces by T. S. Baldwin, of Egremont; hot-house grapes by Mrs. S. L. Pollock and Edward Pomeroy; out-door grapes by Oren Curtis, of Sheffield, etc.

Maple-sugar was shown by Mrs. Lester Gorton; honey by F. A. Martin, and plums by W. H. Nichols, of Richmond. There also was a fine display of canned fruit, jellies and preserves.

Bread, 100 entries, consisting of wheat, rye, brown, graham and biscuit.

There were 46 entries of butter, and 15 of cheese.

The floral department received 37 entries, and contained many beautiful and rare varieties.

The number of entries in the hall was 1,161; on the ground, 377; making in all, 1,538 entries.

I learned from the committee on agricultural products that they received application for the examination of about 180 entries of summer crops, from residents in 17 towns, extending from the extreme north to the south of the county, also from east to west, which they visited in July. For fall crops there were about 280 entries examined in September.

The committee on farms visited six orchards of apples, two of pears, twelve collections of fruit-trees, three pieces of reclaimed land, and thirty-three farms.

Thus it appears that the S ciety is doing a good work in offering premiums for summer and fall crops, as well as for articles exhibited at the annual exhibition.

Other engagements prevented my remaining to witness the proceedings of the third day, which comprised the delivery of an address by Prof. Sanborn Tenney, of Williams College, and the awarding and distributing of premiums, principally of silver plate. The day's fair concluded with an exhibition of trotting-horses.

I found that the members and officers of the association were live men and women, who have the best interest of the society in view, and I know of no organization where the state bounty is better applied than it is with this. I shall ever remember the cordial reception and generous hospitality and courtesy received from them, for which they have my sincere thanks.

AMOS BATES.

HOOSAC VALLEY.

I attended the Hoosac Valley Society at North Adams on the 16th and 17th of September.

The officers of the Society had taken particular pains to have the show of cattle a success, and had had the promise from the farmers of more and better stock than at any previous show, but the fears of the cattle disease kept away at least two-thirds of the cattle expected. But there was quite a respectable showing as it was.

Van Buren Mallory, of Pittsfield, exhibited twin steers, two years old, weighing 2,426 pounds; L. J. Follett, of South Adams, a fine Jersey bull, and two heifers of the same breed; Amasa Richardson a fine herd of Jerseys; John M. Cole, the president, two pairs of fat oxen, weighing together 8,500 pounds. There was a very good show of milch cows.

The show of sheep was the best of any that I have seen at any of our fairs; the most in number and the best in quality.

The show of swine was not large. Bradford Harrison exhibited some nice sows and pigs, which attracted considerable attention.

The poultry was very fully represented, embracing nearly all varieties, and was a credit to the society.

Exhibitors of all kinds of household manufactures, agricultural

implements, fruits, vegetables, and works of art, were very fully represented in the hall. I think this department was truly a success.

It was thought by many that the exhibition of horses, on the second day, was the best that was ever seen on the Society's grounds. Breeding-mares, with colts by their sides, showed that the farmers of Northern Berkshire were paying particular attention to raising good horses. Of gentlemen's driving-horses, some were very good, as were also some family-horses.

The Society have labored under many difficulties since their commencement. The October flood of 1871 injured their grounds to the extent of several hundred dollars. But they have a live set of officers, who are determined to make the Society a success. Their receipts this year were larger than their expenses, which I think cannot be said of any other society in Western Massachusetts.

ELNATHAN GRAVES.

HOUSATONIC.

The fair of this Society was held at Great Barrington, September 29 and 30 and October 1.

This being our first visit to this section of the State, we were at once interested and delighted with the romantic country from Pittsfield to the fair-grounds.

Before entering the grounds we had a view of them from the highway, and witnessed the usual preparations preceding the opening. Cattle were arriving, and were also quietly grazing on the grounds. The products of the farm and household, of every description, were brought in. The officers and committees were busy with the duties preliminary to the opening, and the people were out in force to witness the doings.

Official duties in connection with another society limited our time here to a few hours, and we entered upon the examination of the display in the Society's hall, a large building, which seemed ample for the accommodation of exhibitors.

The vegetable department, occupying the basement of the building, was well filled with contributions, comprising the usual variety grown in this climate, and it was a very creditable exhibition. The varieties exhibited skill and care in their cultivation, but apparently the want of it in using impure seed, and by showing the largest specimens, instead of those representing the true type of their sort. The best results are not obtained by a show of the largest specimens, but the truest of their respective sorts.

The display of tools and implements was good, and instructive to those giving them careful examination; and we were informed that the farmers hereabout have not been slow in adopting and using the most improved implements in their husbandry. In the upper hall were displayed the butter and cheese, bread, fruit, household manufactures, fancy-work, drawings, paintings, flowers, and everything which contributes to the comfort and refinement of the farmer's home. The fruits were shown, or were attempted to be shown, under glazed sash, raised to such an angle that no mortal could distinguish their kinds, or discern their virtues or defects. An attempt to display fruit under such circumstances is neither attractive, instructive, or advisable.

The exhibition of butter was large, and denoted, as a whole, good dairy management, good cows, and good pastures, each and all indispensable for the best results. Some of the butter was of marked excellence, and the competition seemed spirited for the prizes.

The display of household manufactures was in a high degree meritorious, and in great variety; that of domestic carpeting, the largest and best we have ever seen, indicating durability as well as good taste and domestic industry.

There were other articles of domestic industry in great profusion, which contributed largely to the exhibition.

The show of flowers was fine, considering the lateness of the season, and the hall exhibition, as a whole, was very creditable to all contributors.

We now turned our attention to the live-stock. The fat cattle were well grown and well fattened, had received good care and good pasture, had been handled well, and were well fitted for the shambles.

The working oxen and steers were there in goodly numbers, were well grown and matched, and appeared well trained for all purposes required of oxen.

With even a superficial examination of the dairy-stock we were much pleased; nearly all breeds and their grades were represented, each owner feeling that his own stock was best adapted to his circumstances. As we like all breeds, and are prejudiced against none, not even the natives, we tried to appreciate the exhibition as it was then and there presented, and we have seldom seen stock that looked so well as a whole; we saw but few ordinary animals, and none that were poor, and many whose intelligent breeding and care were creditable to the owners, who by commendable skill, and by persistent efforts, contributed so largely to the interest of the fair.

The breeders who, by good foresight and care, can show a strain

of any breed of uniform type and fixed characteristics, that have the inherent force to transmit their virtues to their progeny with reliable certainty, may justly term their strain pure-bred, and their pedigree self-evident and undoubted.

After looking at the poultry, and all departments of the fair, we were impressed with the conclusion that the Society was surely and steadily doing its legitimate work, and doing it well.

O. B. Hadwen.

NORFOLK.

The undersigned, appointed to visit the Norfolk County Society, respectfully reports that paramount official duties prevented him from attending but one day of the twenty-seventh annual exhibition of the Society, held on the 30th of September and 1st of October last. The day was a pleasant one, and your delegate was kindly received and cared for by Col. Stone, Mr. Hildreth the secretary, and other officers of the Society.

The exhibition was a very creditable one to the Society, and in many departments it was truly excellent, especially the show of fruit, and preëminently of pears. This was indeed very superior, in variety, size and quality; many specimens were not only large, but remarkably fair and perfect, qualities in which the fruit shown at the fairs of this Society always excels. The show of 114 choice varieties by Col. Wilder, attracted, as it deserved, very great attention. Others, also, exhibited fewer varieties, but in single plates, sometimes equalling, if not surpassing, the standard samples of the king of pears.

The exhibition of neat-cattle was also remarkable, among which our attention was especially called to the beautiful Jersey herd of Hon. Henry L. Pierce, of Canton, and also to a very superior animal owned by Charles Faulkner, of Brookline, with a calf by her side, which were truly remarkable.

The horses owned by the president, Col. Henry S. Russell, of Milton, were beautiful animals, and he may well "fear naught" in comparison with them.

The undersigned deeply regretted his inability to be present on Friday, "the great day of the feast," when the address of Col. Theodore Lyman was delivered, and the annual dinner eaten; but he was assured that everything passed off pleasantly, and that this Society is increasing in usefulness and vigor.

Edmund H. Bennett.

BRISTOL.

The duty of attending and reporting on the fifty-second exhibition of the Bristol County Fair was assigned to me by the Board of Agriculture. The fair was holden at the agricultural grounds in the city of Taunton, on the 29th and 30th of September and on the first day of October last. The weather, although not so delightful for an agricultural fair as could be desired, was more pleasant than the average, and decidedly more desirable than fell to the lot of many other societies at their annual meetings this year.

The morning of the second day was obscured by clouds, to the great annoyance of many who were eagerly watching for a glimpse of the sun, but it was discernible only through the smallest rifts in the clouds.

There was a smaller number of entries for ploughing with oxen than usual, but there were eighteen entries in ploughing with spans of horses. Your delegate was not on the grounds, and so cannot speak of the comparative merits of each contestant, but from the appearance of the land after it was ploughed the conclusion was reached that the ploughmen were not novices, and the teams were able-bodied.

After the ploughing-match came the exhibition of family-horses on the track. A number of animals were on the grounds doing credit to themselves, their owners, and the county, and premiums were awarded, according to their merits, by the committees.

Next came the procession of town teams,—17 yoke of oxen from Raynham, 15 from Rehoboth, ten from Norton,—and they marched around the track, preceded by the Providence Band, "keeping step to the music of the Union," under the yoke, and in chains.

In the afternoon came on the trial of gentlemen's horses. Subsequently, the draught-horses were subjected to their trials, and finally was inaugurated for the day trotting by the four-year-old colts of the county. These several classes had their day and generation for an hour, were subjected to their trials, enjoyed the plaudits of the admiring crowds, and passed from their distinguished positions to mingle again on a common level with the less favored members of the bovine and equine races.

The races were exciting, and the trotting fair would not have been regarded as slow by the sporting community.

The horse is a noble as well as a useful animal to man. Every one enjoys a sharply-contested trial of speed between horses equally matched, squarely trotted and fairly driven; but the jockey who whips, runs, pulls and scores his steed for the sake of gaining some

undue advantage over his competitor, does much to render an honest agricultural horse-trot unpopular, and tends, so far as he can, to degrade manhood below horsehood.

The entries in the several departments of working cattle, fat cattle, bulls, cows, heifers, etc.,—pure breds, grades and natives,—were in large numbers. Many of the specimens were fine, and premiums were awarded by the committees as seemed good in their sight. Of thoroughbred stock, Ayrshires were the most numerous, while grades and natives outnumbered all the rest.

The exhibition in the hall of bread and butter, cheese and honey, fruits, vegetables, flowers, greenhouse plants, bouquets, domestic manufactures and specimens of the handiwork of the ladies, was, to use the language of one of their own number, "perfectly splendid." This language will convey a truer idea of the reality than can be formed from any old Saxon at my command.

The specimens of fruit were good, although the season had not been as propitious for this kind of products as many others. This was not the bearing year for apples, although many specimens were on exhibition that would have done honor to any contributor and any year. The severe winter, the cold spring and the untimely frosts of autumn rendered the grape crop a failure, except in warm soils and sheltered localities, yet Mr. Forrister, of Somerset, showed some superb specimens.

Pears were displayed in profusion,—pleasant to the eye, tempting to the hand, and doubtless luscious to the taste of those whose duty required them to report on their comparative merits.

The silver ware from Reed & Barton, the elegant machines from the Mason Machine Works, the large show of agricultural products, of one hundred and fifty varieties, of Charles Albro, of Taunton, were peculiarly attractive and interesting.

A grocery-store was on exhibition, equipped with every article the school-boy would call for, from a jackknife to a jew's-harp; the school-girl select, from chewing-gum to a mint-drop; the farmer want, from a cow-bell to a plug of tobacco; and the good matron need, from a quarter of tea to a yeast-cake.

The committee on hay have awarded the premiums on that article to W. F. Woodward, of Taunton, $12, for five tons 800 pounds, grown on one-half acre of land; to B. D. Snow of Raynham, $8, for ten tons 1,280 pounds, grown on one acre. This was not on exhibition at the fair, but common farmers would call $10\frac{3}{4}$ tons to an acre a pretty tall, stout, heavy crop of grass, and shows that manures, in most cases, are spread over much too large a surface.

The most unique feature of the occasion was the poultry exhibition. The new structure, erected the last year for its accommoda-

tion, was filled to overflowing. The display of the domestic fowls would do credit to a poultry show par excellence, and was on a much grander scale than I have ever seen at any agricultural fair, there being over two hundred contributors to this department. I am not an adept of sufficient skill to decide on the comparative merits of the different breeds, but can only say it must be a worthy prototype of the poultry exhibition of the centennial year, one thousand eight hundred and seventy-six.

The dinner was served at the Society's hall, on the second day. The president of the Society, Mr. Mason, being detained on account of sickness, the Hon. Judge Bennett welcomed the guests in a short speech, and presided at the table. After partaking of a bountiful repast, spread for more than four hundred, and enjoying the music from the band, Hon. Samuel B. Noyes delivered an address on Bristol County farmers, the "embattled farmers," the bone and muscle of the colonies of 1776. It was estimated that over twelve thousand persons were on the grounds during the fair. The Society is in a prosperous condition, has ample grounds, a large hall, and a praiseworthy *esprit du corps* among its members. A feeling seemed to pervade the community that this holiday of the farmers was one of the gala days of the year, and a determination to get their share of pleasure, so abounding and so accessible to all, seemed to be omnipresent.

During my stay in Taunton, and while on the agricultural grounds, I was and still am under obligations to Judge Bennett, Avery P. Slade, Esq., and Col. W. D. Tripp and his lady, for kindness and courtesy shown me on the occasion.

HORACE P. WAKEFIELD.

MARSHFIELD.

Although the protracted storm kept away thousands from the show-ground, yet the exhibition of animals in the several classes was extremely good, and the number of entries was above an average of previous years.

There was a large number of entries in the different classes of horses, and about twenty premiums were awarded.

Of cows there were 15 entries, and seven premiums were paid, amounting in all to about $36. Of heifers, under three years old, there were seven entries; under two, 18. Among these the Jerseys predominated. There was a very fine exhibition of calves, 22 entries, and all fine stock.

The sheep exhibited were very respectable in quality, but few in numbers.

The show of poultry is seldom equalled at a county fair, and $60 were distributed among 35 competitors.

The products of the field and garden were admirable, 150 entries being made and $120 distributed among contributors by the committee.

The display of fruits showed that great pains had been taken to perfect the various kinds.

Thirty-eight varieties of pears were entered by one person, and 40 others entered from three to 10 each; 28 received premiums or gratuities.

Apples, peaches, quinces, grapes and cranberries also found a place upon the fruit-tables.

Grapes were abundant, there being 37 entries, all good collections, worthy of premiums, yet there were prizes for only 25.

The ladies, too, came in for their full share of agricultural distinction. The different kinds of domestic manufactures and fancy articles exhibited by them, the work of their own hands, gave the best evidence of their qualifications to discharge the various duties appertaining to housewifery; 244 premiums were awarded to owners of articles under the head of home department. Canned fruits, preserves, butter and cheese were quite abundant; also all the different kinds of bread.

L. P. Warner.

PLYMOUTH.

The exhibition of the Plymouth County Agricultural Society was held at Bridgewater, on September 22d, 23d and 24th. As usual with this society, the concourse of people was large, and the exhibition was conducted with exactness and energy. The entries for premiums on produce were large, and included rye, carrots, onions, beets, turnips, cabbages, parsnips, potatoes, Indian corn and beans. The amount of rye produced to the acre was reported to be, in one case, 37½ bushels, and in another, 30$\frac{15}{16}$ bushels per acre. The former crop was raised at a cost of $32 an acre, and the latter at a cost of $57.01. Another crop of rye was presented, which amounted to 22$\frac{18}{56}$ per acre, and cost $55. Each of these crops seems to have been made profitable by the straw, which finds a ready and liberal market in this county. Of the onion crops, one amounted to 404½ bushels per acre, and another 346⅙ bushels. One cultivator recommends, as a remedy against the maggot, covering the seed-vessels, before the blossoms open, with gauze, to protect them from the fly which lays in the blossom the egg from which the maggot is afterward produced. Of mangolds, a crop of 386 bushels on 50 square

rods, or 1,235$\frac{13}{60}$ bushels per acre, a very creditable yield. Of Swedish turnips, 798 bushels per acre were reported. A return was made of 347$\frac{1}{2}$ bushels of potatoes per acre, the manure applied being plaster and hen manure, in equal parts. A corn crop of 93$\frac{19}{56}$ bushels per acre was reported; another of 89$\frac{43}{56}$; and a crop of beans estimated at 30$\frac{3}{60}$ bushels per acre. Much attention was manifested to the cultivation of fruit, cranberries, and forest trees.

The show of cattle was large and interesting; the collection of cows and heifers especially indicating care and good judgment in the breeding and feeding of this class of animals, upon which so much of the agricultural prosperity of Massachusetts depends. The number of working-oxen was large, and in it were found many valuable animals; and the skill displayed in driving the cattle was highly creditable. There was a good exhibition of stallions, and of farm and family horses and colts. Sheep, swine and poultry were well represented, and the products of the orchard, garden and dairy were abundant; the quality being as good as a somewhat hard soil and an unpropitious climate would promise.

From the attention of the committees, the care and exactness with which they conducted their examinations, and the general management of affairs on the grounds, your delegate received the assurance that the Plymouth County Society still exercises the good influence which it has for so many years exercised over the agriculture of this section of the State. The judicious recommendations of the president, and the elaborate character of the reports, all give evidence of the determination of those engaged in managing the Society to retain for it the reputation it has so long enjoyed as one of the most useful of these industrial organizations in our State.

Geo. B. Loring.

BARNSTABLE.

The two days' fair of the Barnstable County Agricultural Society, which was held this year, September 22 and 23. had favorable weather, and was, all things considered, a success. To your delegate, fresh from the mountains of Berkshire, the beautiful old seaside town of Barnstable itself rivalled the attractions of the show.

The annual meeting of the Society took place, on the morning of the first day, in the custom-house, being the first since the change was made in the time for holding it. The report of the treasurer showed that the expenditures for premiums last year were $628, and for expenses of the fair $461. Among the receipts were nearly $800

at the gate and hall. The Society is still somewhat in debt, but it is hoped, and with good reason, that it will soon be extinguished.

The hall exhibition, I understood, was not so full as usual, but still was an excellent one. The show of vegetables, especially, was surprisingly large and fine. There was the inevitable big squash. Mr. Cobb showed sugar-beets weighing eighteen pounds each, and nearly all of the new and famous seedling potatoes were attractively presented. And this leads me to say that while light, sandy soils, like that of Barnstable, will produce potatoes of fine appearance and of excellent table quality, repeated experiments have shown that they are by no means so valuable for planting as those grown upon heavier and higher ground, and in a colder climate. If, then, the Cape farmers, and others similarly situated in respect of soils, will be at the trouble and slight additional expense of getting their planting-potatoes, say from the hills of Maine or Vermont, I have not the least doubt that the increase in yield to them will be from one-fourth to one-half greater than from the home-grown "seed."

Of fruit, there was a good display of grapes, and a few fine specimens of pears. Bread showed twenty entries; fancy goods thrice as many.

In the exhibition of animals, the show of horses was small, but the trials of speed in the afternoon brought in another class, some of them fine animals. The time made, however, did not seem to be specially exhilarating to the owners, and many maledictions were heard on the condition of the track,—improved, it is said, since last year; but still, it must be admitted, sufficiently undulating to form an attractive excuse to a disappointed jockey for making a losing race.

In the cattle-pens were some sixty head,—fat oxen, good steers and heifers, several Jersey cows, about one hundred swine, but only ten sheep, of which seven were Southdowns from the Bacon farm.

As usual at Barnstable, there were present on the second day several distinguished guests, including the Governor; the hall tables were bountifully spread for some three hundred diners, and the after-dinner speeches were numerous and entertaining.

The fair closed with a grand ball in Agricultural Hall.

Henry S. Goodale.

NANTUCKET.

The twentieth annual exhibition of the Nantucket Agricultural Society was held on the 29th and 30th of September. I attended the exhibition as directed by this Board, and upon my arrival was

met at the steamboat landing, on the afternoon of the first day, by the president of the Society, Andrew M. Myrick, Esq., who at once accompanied me to the fair-grounds, situated about one mile from the town.

As one of the *local* institutions of the island, the cattle-show and fair forms an interesting feature, and to a considerable extent the business of the place is suspended during a portion of the time. One of the best evidences of the continued interest in the welfare of this Society is manifested in the large number of entries that are made in all the departments.

I found in the stalls a good show of stock, which compared favorably with any of the previous years. The farmers of Nantucket pride themselves in raising the best quality of milch cows, and the exhibition of a large number of very fine Alderney, Durham, Ayrshire, Jersey and native cows was highly creditable to them.

There were seven entries of working-oxen, and a very good show of horses, sheep, swine and poultry. The ploughing-match, with both oxen and horses, took place on the first day. There were nine entries. After the ploughing-matches followed the sports of the apple race and the wheelbarrow feat.

The trotting-match had attracted a large number, but there were but two entries, and as the time made was not very satisfactory, a good deal of disappointment was manifested by the crowd.

I will take occasion here to refer to the advantages which the farmer of Nantucket has within his reach, in that of the "kelp of the sea," found so abundantly upon her shores. This is made manifest by the experiment recently made upon the *model* Spottswood farm of F. C. Sanford, Esq. During the winter of 1874–5, the laborers upon his farm carted from the seashore 650 loads of kelp, which was spread upon about 12 acres. It was spread six inches thick, and when ploughed in the spring, one man followed the coulter to clear it from the kelp. Eight acres and three-quarters were planted with corn; the balance with turnips, beets, potatoes and carrots. Pumpkin seeds were put in the corn hills. Upon this land was produced 600 bushels of handsome shell corn, 1,200 bushels of turnips, 500 bushels of carrots, and 300 bushels of beets. Some of the carrots measured 14 inches in circumference. In addition to this were harvested 50 heavy loads of pumpkins.

Mr. Sanford laid down 15 acres the last season to oats and grass seed, where crops were cultivated the year previous. The oats were cut in the milk and produced 20 tons! He has made since January 1, 1875, 2,000 pounds of the best quality of butter, which he has sold for 50 cents per pound. In addition to this he made 300

pounds which was used in his own family. His crop of hay the last season was not so large as on some former occasions, yet he has cut enough to winter 35 head of cattle, with a prospect of having a surplus for the market. It is evident that there are thousands of acres of land about the New England shores, now comparatively of but little value, that may be made rich and remunerative by following the example of Mr. Sanford in using the "kelp of the sea," which is found in great abundance upon the sea-coast.

During the two days of the exhibition, the Athenæum Hall, in the central part of the town, formed the great centre of attraction, and was made unusually interesting by the zeal manifested by the ladies. It was tastefully decorated with evergreens and flowers, and hung with appropriate mottoes, from which I read, "Manufactures and Commerce welcome Agriculture as the eldest sister." The fancy-work was very fine, and the large number of superior articles of curiosity and taste added largely to the interest of the occasion. The display of needle-work, embroidery, etc., contained many articles of exquisite taste.

The display of fruits was not so large as on some former occasions. It is not unfrequent that this Society in this department will equal, if not exceed, any agricultural society in the State in raising pears and grapes. Several contributors showed from six to eight beautiful varieties of pears, while there was a great variety of single dishes. The display of hot-house grapes was good. Those exhibited by E. H. Alley were deserving of especial attention. Prominent in this line were those shown by Samuel King, Charles G. Coffin and Henry Coffin.

In the lower hall were exhibited vegetables, bread, butter, etc. The show of vegetables was large, and all the specimens of an excellent quality. There were eight entries of butter.

The entertainments on both evenings were largely attended, and the vocal and instrumental music delighted the audience. The "Song of the Farm," written by Prof. A. B. Whipple, of the High School, was highly applauded. Speeches were made by the president, who tendered his thanks to all who had so generously contributed to the success of the exhibition; by your delegate, who saw evidences that the people of Nantucket might *profitably* give more attention to farming; and by Prof. Whipple, who thought that to make farms more productive, as in France, Switzerland and Austria, they must be fed with all possible enrichments, including *brains*.

In closing my report, it is with pleasure I mention the cordial reception I received through the gentlemanly attentions of the president of the Society and his family, and from the secretary, Alex-

ander Macy, Jr., Esq. The hospitality, so universal, rendered my visit one of unusual pleasure.

It is enough to say that the affairs of this Society are in the hands of faithful, competent officers, and cannot fail to lead to success.

S. B. Phinney.

MARTHA'S VINEYARD.

The eighteenth annual cattle-show and fair of the Martha's Vineyard Agricultural Society began October 5. The grounds and buildings are small, yet they may be large enough for the purpose for which they are designed. The hall was too full to look well, particularly the vegetable department, which would have displayed to much better advantage had it occupied more space.

The officers were alive, and deeply interested in its success, yet like all fairs, not all the best fruit or vegetables appeared on exhibition.

There are in almost every society some little jealousies which are not always particularly pleasant while soliciting articles for exhibition. No one knows but the officers themselves, how far a kind word and willing heart go towards making the fair pleasant as well as successful. Too much blame is often bestowed upon its officers in the case of failure. All does not depend on its officers; officers and people are to work together.

The largest contributors generally find the least fault, and the persons furnishing little or nothing are the ones that generally do the fault-finding, and are never satisfied with its officers, or anything. The people of the island are hospitable and generous, but appear to enjoy and attend to the fishing and shipping interest more than agriculture, but while at home in vacation spend a little time in tilling the soil. The soil appears light and sandy, yet yields a good and bountiful crop when thoroughly cultivated. Corn can be grown with good success at the rate of 80 bushels to the acre, and as good vegetables can be grown there as can be produced in the State. It is plain to be seen that if the people would give attention, and prepare the soil as well as they do in other parts of the State, farming would pay.

The neat-stock of the island is far behind other counties of the State. What there is, appears to be a poor grade of Ayrshire. There was not a bull upon exhibition, and I was told there was not a blooded animal upon the island; they will be obliged to improve the stock, or else will have no cattle to exhibit. There were 23 entries of cattle,—125 head; among them there was quite a fair lot of

cows, and five or six yokes of oxen, the cows and oxen forming the best part of their stock.

The exhibition of sheep and poultry compared well with any other exhibition, both in quantity and quality.

The vegetables made quite an extensive display, some of which were good and some poor. The seed from which they were grown evidently was not pure, squashes in particular. One of the first and most important items in growing good vegetables, is to procure well-ripened, pure seed; then you can gather vegetables which will be good, and find a ready market. I would grow less, and have them better. No farmer can afford to prepare land and plant poor seed.

There was a good display of fruit. Grapes, as in most places, were not quite ripe; however, fruit can be grown and ripened in Dukes County.

The ladies' department was full, and many articles on exhibition should have received more premiums, and others should have received nothing. There were some seventy tidies exhibited, some receiving only five cents premium. I believe in giving premiums to the best only, and no premium should be less than twenty-five cents. The butter was good enough. Bread, cake and canned fruits were excellent, and exhibited in large quantities. The native wine, I think, must have been superior, judging from the time occupied by the committee in awarding the first premium.

According to the books of the secretary, the number of entries was one-fourth larger than ever before, which shows plainly that the Society is alive and in a prosperous condition, taking quite an interest in its fairs; and when the people introduce better stock, and give the land better cultivation, they will be able to give exhibitions that will rank among the best of the State. But, "with all thy faults, I love thee still," and when we take into account that there is upon the island a population of only four or five thousand, and less than one-fourth of that number take any part, or have any interest whatever in its success, I must say they did nobly, and deserve the sympathy and aid of the State.

Thanks to the delegate, Mr. Hebron Vincent, and to the officers, for their kind and generous hospitality to me while among them.

W. L. Warner.

FINANCES OF THE SOCIETIES.

Societies.	Amount received from the Commonwealth.	Income from permanent fund.	New members and donations.	All other sources.	Receipts for the year.	Premiums offered.	Premiums and gratuities paid.	Current expenses for the year, not including premiums and gratuities.	Disbursements for the year.	Indebtedness.	Value of real estate.	Value of personal property.	Permanent fund.
Massachusetts,	–	$4,419 37	–	$3,926 86	$8,346 23	–	$3,800 00	$3,164 75	$6,964 75	–	–	$76,982 47	$76,982 47
Essex,	$600 00	1,969 68	$176 00	1,356 32	4,102 00	$3,120 00	2,150 00	2,890 85	5,040 85	–	$8,000 00	19,027 02	27,027 02
Middlesex,	600 00	–	823 00	3,064 02	4,487 02	2,326 00	1,379 23	1,428 84	4,237 53	$16,500 00	25,000 00	300 00	8,500 00
Middlesex North,	600 00	500 00	49 00	1,868 66	3,017 66	1,563 00	629 25	1,313 72	2,313 72	2,000 00	20,000 00	800 00	18,800 00
Middlesex South,	600 00	–	62 00	2,767 79	2,829 79	2,279 75	1,822 25	–	–	10,900 00	18,000 00	–	7,100 00
Worcester,	600 00	–	85 00	6,385 17	7,070 17	2,587 75	2,096 37	4,542 40	6,638 77	38,500 00	125,000 00	1,000 00	87,500 00
Worcester West,	600 00	–	38 00	1,937 51	2,595 51	2,209 25	1,875 57	1,266 70	3,142 27	3,200 98	13,000 00	600 00	10,399 02
Worcester North,	600 00	–	295 50	13,831 00	14,726 50	947 75	726 35	13,399 61	14,125 96	11,900 00	16,000 00	50 00	4,500 00
Worcester N. West,	600 00	–	120 00	2,521 60	3,241 60	1,628 00	1,279 16	2,001 55	3,430 71	9,722 47	16,000 00	1,700 00	7,977 53
Worcester South,	600 00	1,000 00	163 00	2,540 54	4,203 54	1,796 50	1,437 50	1,337 25	3,291 75	5,000 00	12,500 00	1,400 00	8,900 00
Worcester So. East,	600 00	–	47 00	2,474 75	3,121 75	1,293 00	645 67	2,404 68	3,050 35	10,440 00	14,000 00	1,000 00	4,556 35
Hampshire, Franklin and Hampden,	600 00	–	256 00	3,969 95	4,825 95	1,175 75	704 69	3,938 04	4,645 73	–	14,000 00	300 00	6,300 00
Hampshire,	600 00	–	174 19	707 50	1,481 69	915 50	637 00	816 93	1,453 93	1,100 00	6,000 00	300 00	6,000 00
Highland,	600 00	42 00	87 00	601 69	1,330 69	829 80	703 80	626 14	1,329 94	25 00	3,000 00	1,100 00	4,100 00
Hampden,	600 00	–	42 50	2,673 97	3,316 47	1,777 00	801 38	2,246 57	3,047 95	24,000 00	60,000 00	268 52	36,000 00
Hampden East,	600 00	–	65 00	412 86	1,077 86	1,259 75	774 29	251 15	1,125 61	179 97	5,000 00	–	5,000 00
Union,	600 00	–	86 00	1,085 20	1,771 20	1,142 15	676 20	1,049 22	1,725 42	1,125 00	4,600 00	710 00	4,185 00
Franklin,	600 00	120 00	181 00	855 51	1,756 51	1,509 75	1,183 00	937 89	2,021 25	308 58	8,000 00	1,800 00	9,800 00
Deerfield Valley,	600 00	–	230 42	4,809 99	5,640 41	757 90	757 90	4,881 70	5,639 60	2,993 74	8,070 00	75 00	5,151 26
Berkshire,	600 00	315 00	192 00	4,417 47	5,424 47	2,902 00	2,549 00	2,774 21	5,323 21	1,700 00	10,000 00	500 00	10,000 00

Hoosac Valley, . .	$600 00	–	$130 00	$3,722 08	$3,852 08	$2,865 50	$2,278 35	$3,148 75	$4,602 10	$5,720 02	$12,500 00	$818 00	$7,597 98
Housatonic, . .	600 00	–	154 00	4,400 75	5,154 75	2,400 00	2,230 50	3,348 29	5,628 59	473 84	3,000 00	100 00	*20,000 00
Norfolk, . . .	600 09	–	67 00	4,572 89	5,239 89	3,007 00	1,275 75	3,850 07	5,125 82	30,000 00*	35,000 00	300 00	5,300 00
Hingham, . . .	600 00	–	421 45	3,830 44	4,851 89	1,532 75	863 10	1,174 42	4,866 70	5,000 00	34,600 00	4,600 00	29,600 00
Bristol, . . .	600 00	–	152 00	18,421 57	19,173 57	4,628 00	4,293 00	4,271 19	19,544 49	12,000 00	65,000 00	200 00	53,200 00
Bristol Central, . .	600 00	–	160 00	–	3,614 08	2,892 00	2,292 62	1,321 46	3,547 50	18,650 00	30,000 00	500 00	11,850 00
Plymouth, . . .	600 00	$180 00	235 30	15,702 98	16,728 28	3,934 00	2,930 01	2,958 97	16,728 28	10,583 31	40,000 00	2,000 00	32,000 00
Marshfield, . .	600 00	–	131 94	2,522 19	3,254 13	1,365 75	914 90	2,228 01	3,141 83	5,087 70	11,806 92	1,013 18	7,732 40
Barnstable, . .	600 00	–	28 00	833 44	1,461 44	826 00	610 64	542 00	1,152 64	1,650 00	6,000 00	200 00	4,350 00
Nantucket, . .	523 47	24 00	171 00	243 82	962 29	1,068 50	581 10	395 95	977 05	–	2,400 00	241 77	2,641 77
Martha's Vineyard, .	600 00	120 00	20 67	437 49	1,178 16	884 00	630 85	400 63	1,031 48	450 00	3,000 00	2,500 00	5,500 00
Totals, . .	$17,923 47	$8,690 05	$4,843 97	$115,906 61	$149,837 58	$57,024 10	$45,429 43	$74,881 74	$144,892 79	$209,210 91	$629,476 92	$120,385 96	$528,550 80

* $17,000 of this Permanent Fund consists of notes of members of the Society.

PERMANENT FUND—HOW INVESTED.

MASSACHUSETTS.—In bank stock, railroad stock and bonds, mortgages and policies in Mass. Hospital Life Ins. Co., and cash.
ESSEX.—In farm, bank stock, railroad bonds, Salem Gas Co. stock, and tents, cattle-pens, &c.
MIDDLESEX.—In real estate and personal property.
MIDDLESEX NORTH.—In real estate and personal property.
MIDDLESEX SOUTH.—In land and buildings, horse-stalls, half-mile track, cattle-sheds and swine-pens.
WORCESTER.—In real estate.
WORCESTER WEST.—In real estate and personal property.
WORCESTER NORTH.—In real estate and exhibition buildings.
WORCESTER NORTH-WEST.—In the grounds and buildings of the Society, personal property for the use of the Society, and cash.
WORCESTER SOUTH.—In land, track, pens, hall, furniture and fixtures.
WORCESTER SOUTH-EAST.—In real estate and personal property.
HAMPSHIRE, FRANKLIN AND HAMPDEN.—In real estate.
HAMPSHIRE.—In land, buildings, track, fixtures, &c.
HIGHLAND.—In mortgage on real estate and in savings bank.
HAMPDEN.—In real estate.
HAMPDEN EAST.—In fair-grounds, track, seats, fences, cattle-pens and exhibition building
UNION.—In exhibition-grounds, barn, hall and furniture in hall.
FRANKLIN.—In real estate, bank stock and fixtures.
DEERFIELD VALLEY.—In real estate.
BERKSHIRE.—In real estate.
HOOSAC VALLEY.—In real estate occupied by the Society.
HOUSATONIC.—In real estate and notes of members.
NORFOLK.—In real estate occupied by the Society.
HINGHAM.—In hall and grounds.
BRISTOL.—In real estate,
BRISTOL CENTRAL.—In real estate.
PLYMOUTH.—In real estate, fixtures and furniture.
MARSHFIELD.—In sixteen acres of land, two halls, out-buildings and hall furniture.
BARNSTABLE.—In land and buildings.
NANTUCKET.—In agricultural grounds and buildings, hall, furniture and cash.
MARTHA'S VINEYARD.—In land, agricultural hall, and notes of members.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED.

FARMS.

SOCIETIES.	For management of farms.	For experiments in draining.	For ploughing at exhibition.	For reclaiming swamp lands.	For experiments with manures.	For spading.	For hedges and ornamental trees.	For reclaiming old pastures.	For orchards of all kinds.	For cranberries.	For other farm improvements.	Total amount offered for farm improvements.	Total am't awarded for farm improvements.	Total amount paid for farm improvements.
Massachusetts,	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Essex,	–	$15 00	$186 00	$15 00	–	–	–	$15 00	–	–	–	$340 00	$231 00	$210 00
Middlesex,	–	–	64 00	–	–	–	–	–	–	–	–	185 00	64 00	–
Middlesex North,	$25 00	–	–	–	–	–	–	–	–	$8 50	$20 00	130 00	53 50	8 50
Middlesex South,	–	–	50 00	–	–	–	–	–	–	1 00	–	117 00	51 00	51 00
Worcester,	–	–	87 00	–	–	–	–	–	–	–	–	87 00	90 60	90 60
Worcester West,	–	–	82 00	–	$6 00	–	–	–	–	–	18 00	128 00	106 00	106 00
Worcester North,	–	–	16 00	–	–	–	–	–	–	–	–	16 00	16 00	3 00
Worcester North-West,	–	–	9 00	–	–	–	–	–		–	–	9 00	8 00	8 00
Worcester South,	–	–	66 00	–	–	–	–	–	–	1 75	–	–	135 00	–
Worcester South-East,	–	–	88 00	–	–	–	–	–	–	–	–	156 00	88 00	88 00
Hampshire, Franklin and Hampden,	–	–	–	–	–	–	–	–	–	–	–	40 00	–	–
Hampshire,	–	–	–	–	–	–	–		–	1 50	–	1 50	1 50	1 50
Highland,	–	–	–	5 00	–	–	–	–	$6 00	–	–	15 00	11 00	11 00

Hampden,	–	–		–	–	–	–	–	–	–	–	–	$127 00	–	–
Hampden East,	–	–	$33 00	–	–	–	–	–	–	–	–	–	217 00	$33 00	$33 00
Union,	–	–	–	–	–	–	–	$2 00	–	–	$6 00	18 00	8 00	8 00	
Franklin,	–	–	–	–	–	–	–	–	–	–	–	54 00	–	–	
Deerfield Valley,	–	$5 00	–	–	–	–	–	–	–	–	–	–	–	–	
Berkshire,	$50 00	–	–	$10 00	–	–	–	–	$47 00	–	18 00	132 00	125 00	125 00	
Hoosac Valley,	40 00	–	–	9 00	$14 00	–	–	–	15 00	–	19 00	120 00	97 00	97 00	
Housatonic,	30 00	–	42 00	–	10 00	–	–	–	36 00	–	–	154 00	118 00	118 00	
Norfolk,	–	–	105 00	–	–	–	–	–	–	–	–	482 00	105 00	60 00	
Hingham,	–	–	20 00	–	–	–	$2 40	–	–	–	–	56 00	22 40	22 40	
Bristol,	–	–	211 00	–	–	–	–	–	10 00	–	–	583 00	10 00	–	
Bristol Central,	–	–	49 00	–	–	–	–	–	–	–	–	–	–	–	
Plymouth,	–	–	66 00	–	–	–	–	–	–	$25 00	–	367 00	81 00	81 00	
Marshfield,	–	–	37 00	–	–	–	–	–	–	18 50	10 00	211 00	65 50	65 50	
Barnstable,	–	–	21 00	–	–	–	–	–	–	9 00	–	151 00	30 00	30 00	
Nantucket,	–	–	37 00	–	–	–	–	–	–	–	–	128 00	37 00	37 00	
Martha's Vineyard,	–	–	5 00	–	–	–	1 00	–	–	7 00	–	53 00	13 00	12 75	
Totals,	$145 00	$20 00	$1,274 00	$39 00	$30 00	–	$3 40	$17 00	$114 00	$72 25	$91 00	$4,077 50	$1,600 50	$1 267 25	

Analysis of Premiums and Gratuities Awarded — Continued.

FARM STOCK.

SOCIETIES.	For Bulls.	For Milch Cows.	For Heifers.	For Calves.	For Working Oxen.	For Steers.	For Fat Cattle.	For Horses.	For Sheep.	For Swine.	For Poultry.	All other Stock.	Total amount offered for Live Stock.	Total am't awarded for Live Stock.	Total amount paid out for Live Stock.
Massachusetts,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*$877 37
Essex,	$64 00	$132 00	$103 00	–	$53 00	$25 00	$33 00	$266 00	$28 00	$70 00	$133 00	$100 00	$1,075 00	$997 00	950 00
Middlesex,	18 00	70 00	35 00	$11 00	18 00	–	23 00	187 00	–	56 00	60 00	95 00	1,077 00	573 00	437 45
Middlesex North,	20 00	80 00	19 00	–	19 00	16 00	8 00	221 00	5 00	23 00	83 50	9 00	842 00	511 50	350 00
Middlesex South,	16 00	84 00	41 00	7 00	24 00	–	12 00	168 00	19 00	50 00	98 50	–	1,436 00	519 50	490 50
Worcester,	79 00	147 00	144 00	18 00	205 00	71 00	32 00	138 00	14 00	39 00	18 00	52 00	1,506 00	1,105 00	1,039 00
Worcester West,	61 00	80 00	43 00	40 00	56 00	58 00	51 00	323 00	26 00	28 00	32 00	24 00	1,658 00	1,506 32	1,506 32
Worcester North,	19 00	22 00	25 50	34 50	8 00	4 50	15 00	82 00	–	17 50	8 50	38 00	334 50	274 50	274 50
Worcester North-West,	40 00	39 00	27 00	28 00	12 00	30 00	34 00	133 00	17 00	24 00	21 00	77 00	710 00	482 00	477 66
Worcester South,	60 00	18 00	50 00	35 00	54 00	51 00	34 00	714 00	21 00	21 00	1 50	59 00	1,248 50	1,118 50	1,102 50
Worcester South-East,	9 00	28 00	22 00	–	75 00	49 00	8 00	92 00	14 00	35 00	21 50	62 00	424 00	404 00	315 12
Hampshire, Franklin and Hampden,	46 00	43 00	54 00	11 00	32 00	7 00	28 00	117 00	34 00	24 00	110 00	107 00	841 00	620 50	556 50
Hampshire,	21 00	43 00	6 00	17 00	41 00	6 00	12 00	–	32 00	28 00	25 00	49 00	319 00	280 00	280 00
Highland,	33 00	39 00	22 50	6 75	41 00	25 50	15 00	130 50	56 00	12 00	12 00	54 00	501 25	447 25	447 25

Hampden, . . .	$56 00	$92 00	$43 00	–	$40 00	$34 00	$28 00	$143 00	$23 00	$18 00	$50 00	$70 00	$912 00	$597 00	$531 50
Hampden East, . .	45 00	27 00	28 00	$4 00	40 00	35 00	26 00	253 00	27 00	35 00	15 00	52 00	736 00	589 00	531 50
Union, ...	37 00	66 00	11 75	16 75	45 00	28 00	16 00	117 00	17 00	8 00	8 25	77 00	837 00	446 75	410 75
Franklin, . . .	49 00	115 00	18 00	18 00	73 00	54 00	18 00	250 00	101 00	29 00	46 00	57 00	995 00	827 00	804 25
Deerfield Valley, . .	30 00	7 00	12 00	15 00	56 00	21 00	–	134 00	53 00	14 00	15 00	49 00	571 00	406 00	406 00
Berkshire, . . .	114 00	147 00	78 00	30 00	28 00	19 00	23 00	396 00	89 00	46 00	48 00	48 00	1,208 00	1,066 00	1,066 00
Hoosac Valley, . .	26 00	38 00	11 00	3 00	20 00	5 00	5 00	177 00	164 00	13 00	60 00	6 00	759 00	528 00	525 00
Housatonic, . . .	61 00	45 00	55 00	15 00	47 00	41 00	30 00	226 00	112 00	32 00	54 00	196 00	994 00	914 00	914 00
Norfolk, . . .	42 00	80 00	28 00	–	17 00	–	–	588 00	–	75 00	120 00	–	1,071 00	950 00	875 00
Hingham, . . .	28 00	80 00	23 50	–	18 00	5 00	14 00	83 00	24 50	55 00	38 25	41 00	738 25	410 25	410 25
Bristol, ...	47 00	190 00	182 00	37 00	130 00	44 00	99 00	200 00	33 00	59 00	211 00	–	1,105 00	1,532 00	1,500 00
Bristol Central, . .	133 00	84 00	116 00	–	73 00	–	45 00	196 00	–	103 00	175 00	39 00	–	–	–
Plymouth, . . .	62 36	136 00	60 70	62 00	76 00	57 00	85 00	182 00	67 60	54 00	115 00	48 00	1,267 00	1,005 66	1,005 66
Marshfield, . . .	16 00	36 00	36 00	20 00	21 00	6 00	26 00	81 25	4 00	24 00	48 25	–	506 50	318 50	318 50
Barnstable, . . .	15 00	–	21 00	8 00	15 00	11 00	38 00	23 00	14 00	38 00	39 00	–	287 00	222 00	222 00
Nantucket, . . .	26 00	58 00	31 00	–	14 00	3 00	12 00	54 00	24 00	22 00	27 00	–	600 50	271 00	271 00
Martha's Vineyard, .	–	32 75	26 25	5 25	25 00	12 50	24 25	42 25	54 25	4 00	33 00	11 00	401 75	270 50	270 50
Totals, . . .	$1,283 36	$2,158 75	$1,363 20	$442 25	$1,376 00	$718 50	$794 25	$5,719 00	$1,075 35	$1,056 50	$1,727 25	$1,420 00	$24,063 25	$19,192 73	$19,076 08

* Cost to the Society, in 1874 and 1875, of selecting, importing and keeping for one year, and distributing throughout the State, by auction sale, of a herd of Guernsey cattle, introduced for the purpose of improving the stock of the State.

Analysis of Premiums and Gratuities Awarded — Continued.

FARM PRODUCTS.

SOCIETIES.	Indian Corn.	Wheat.	Rye.	Barley.	Oats.	Beans.	Grass Crops.	Grass Seeds.	Potatoes.	Carrots.	Beets.	Parsnips.	English Turnips.	Ruta-Bagas.	Onions.	Collections of Vegetables.
Massachusetts,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Essex,	$10 00	–	–	–	–	–	–	–	–	$10 00	$10 00	–	–	$10 00	$20 00	$165 00
Middlesex,	3 00	–	$3 00	$2 00	$2 00	$1 00	–	–	$20 00	6 00	5 00	$5 00	$8 00	5 00	11 00	15 00
Middlesex North,	7 00	$3 00	6 00	–	3 00	6 00	–	–	8 00	1 00	4 00	3 00	2 00	2 00	2 00	18 00
Middlesex South,	42 00	3 50	1 50	1 50	1 50	1 50	–	–	6 00	–	1 50	–	3 00	–	1 00	18 00
Worcester,	5 00	3 00	6 00	2 00	3 00	1 00	–	–	6 00	1 00	2 00	1 00	1 00	1 00	1 00	6 00
Worcester West,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14 50
Worcester North,	2 75	–	–	–	–	–	–	–	75	–	–	–	–	–	75	6 50
Worcester North-West,	4 00	5 00	3 00	3 00	3 00	1 00	–	–	3 00	–	1 00	–	–	–	1 00	3 00
Worcester South,	24 00	–	12 00	–	6 00	–	–	–	24 00	–	–	–	–	–	–	14 00
Worcester South-East,	–	–	5 00	–	–	–	–	–	–	4 00	–	–	4 00	–	–	22 50
Hampshire, Franklin and Hampden,	1 00	–	1 00	–	–	–	–	$1 00	1 50	–	–	–	–	–	–	15 00
Hampshire,	6 00	5 00	3 00	–	2 00	3 00	–	5 00	7 00	1 50	1 50	1 50	1 50	1 50	3 00	5 00
Highland,	12 50	3 00	–	5 00	3 00	–	–	–	9 00	6 00	3 00	–	2 00	5 00	2 00	10 00

Hampden,	$3 50	–	–	$5 00	–	–	–	$10 75	–	$0 50	–	–	–	–	–	–	$10 00
Hampden East,	14 75	$1 00	$6 50	6 50	$1 25	–	–	8 50	$0 50	7 50	$0 50	–	$0 50	$2 00	$2 00	–	14 00
Union,	6 00	–	6 00	$5 00	6 00	–	$6 00	6 00	–	8 00	–	–	6 00	5 00	5 00	–	8 55
Franklin,	2 00	5 00	–	–	–	–	–	3 00	–	–	–	$5 00	–	5 00	5 00	–	13 00
Deerfield Valley,	1 50	1 00	75	1 25	1 00	50	–	2 00	25	50	–	1 00	–	75	75	–	4 00
Berkshire,	64 00	15 00	35 00	25 00	35 00	9 00	15 00	$50 00	12 00	12 00	–	4 00	14 00	6 00	6 00	–	103 00
Hoosac Valley,	28 00	12 00	15 00	15 00	21 00	5 00	20 00	48 00	5 00	6 00	6 00	3 00	6 00	6 00	6 00	–	69 00
Housatonic,	102 00	27 00	87 00	19 00	60 00	9 00	51 00	9 00	33 00	14 00	–	9 00	–	1 00	1 00	–	9 00
Norfolk,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	103 00
Hingham,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	34 05
Bristol,	43 00	–	–	–	–	–	25 00	–	–	–	–	–	20 00	–	–	–	54 00
Bristol Central,	10 00	–	–	–	–	–	–	18 00	–	–	–	–	6 00	6 00	6 00	–	37 50
Plymouth,	35 00	–	24 00	–	–	10 00	–	4 00	12 00	8 00	–	–	12 00	12 00	12 00	–	64 00
Marshfield,	40 00	50	6 00	–	–	5 00	–	2 50	12 00	6 50	–	–	3 25	7 50	7 50	–	62 50
Barnstable,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	44 70
Nantucket,	11 00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	34 25
Martha's Vineyard,	11 72	45	7 05	45	7 00	8 30	–	–	19 45	1 92	–	4 75	1 00	5 50	5 50	–	8 00
Totals,	$489 72	$84 45	$227 80	$79 20	$164 50	$61 55	$117 00	$119 50	$287 95	$92 92	$17 00	$48 25	$73 25	$98 50	$98 50	$985 05	

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED — Continued.

FARM PRODUCTS — Concluded.

SOCIETIES.	Total amount offered for Grain and Root Crops.	Total am't awarded for Grain and Root Crops.	Total am't paid for Grain and Root Crops.	For Fruits.	For Flowers.	Any other Crops.	Butter.	Cheese.	Preserved Fruits and Vegetables.	Wheat Bread.	Rye and Indian Bread.	Corn Bread.	Total am't paid out under head of Farm Products.
Massachusetts,	–	–	–	–	–	–	–	–	–	–	–	–	–
Essex,	$270 00	$205 00	$205 00	$337 00	$54 50	–	$24 00	–	$3 00	$11 50	$6 00	–	$600 00
Middlesex,	179 00	86 00	125 00	285 00	106 50	$75 00	8 00	–	21 00	26 00	18 00	–	516 00
Middlesex North,	154 00	86 00	50 00	156 50	58 00	–	16 00	–	16 00	14 00	9 00	$15 00	200 00
Middlesex South,	226 75	115 25	115 25	68 25	15 00	36 50	28 00	–	28 00	11 50	5 50	–	480 75
Worcester,	61 50	57 50	57 50	61 00	7 00	–	23 00	$45 00	–	5 75	2 00	–	198 25
Worcester West,	52 00	–	–	60 00	20 00	–	9 00	39 00	–	6 00	6 00	–	206 50
Worcester North,	50 00	–	–	71 50	17 75	–	12 50	2 00	27 75	4 50	3 50	–	150 25
Worcester North-West,	39 00	27 00	31 66	28 00	9 00	6 00	9 00	8 00	–	6 00	–	3 00	88 33
Worcester South,	102 00	80 00	74 00	32 25	8 00	–	9 00	14 00	–	9 00	6 00	–	152 25
Worcester South-East,	102 00	47 00	42 00	35 55	5 95	–	14 00	–	9 50	3 00	2 50	–	105 00
Hampshire, Franklin and Hampden,	13 00	25 00	22 50	53 50	17 00	–	10 00	–	9 00	1 50	1 50	–	89 50
Hampshire,	49 50	46 50	46 50	51 00	19 00	9 50	10 00	10 00	10 00	3 50	6 50	3 50	189 50
Highland,	108 50	63 50	63 50	15 50	7 00	8 50	6 50	3 50	4 75	1 40	1 20	2 20	111 05

Hampden,	$163 00	$62 00	$62 00	$51 75	$7 00	$10 00	$18 00	$8 00	$6 50	$3 00	$3 00	–	$184 88
Hampden East,	89 75	44 25	44 00	31 00	20 75	4 75	9 00	7 00	5 75	3 00	3 00	$3 00	133 00
Union,	93 50	54 00	53 00	8 80	6 25	6 00	4 50	11 00	6 25	2 40	3 60	–	107 70
Franklin,	52 50	33 00	30 50	77 00	39 00	–	21 00	16 00	23 00	7 00	8 00	9 50	229 75
Deerfield Valley,	97 00	67 20	67 20	28 00	7 70	3 00	10 75	7 50	9 60	5 50	4 00	4 50	128 10
Berkshire,	446 00	449 00	449 00	65 00	29 00	–	27 00	38 00	32 00	17 00	11 00	–	668 00
Hoosac Valley,	314 00	293 00	293 00	53 00	28 00	26 00	38 00	46 00	26 00	10 00	5 50	3 50	529 00
Housatonic,	609 00	598 00	598 00	133 50	35 00	–	36 00	43 50	12 00	6 00	6 00	–	897 00
Norfolk,	215 00	103 00	98 00	170 00	37 00	–	10 00	–	11 00	5 00	5 00	5 00	265 00
Hingham,	83 00	34 05	34 05	74 40	29 55	9 30	–	20 00	10 00	2 85	7 50	4 50	192 15
Bristol,	273 00	88 00	50 00	140 25	48 50	–	53 00	15 00	10 50	19 50	8 00	–	–
Bristol Central,	–	–	–	62 25	27 00	–	27 50	7 00	14 25	3 50	3 75	–	–
Plymouth,	315 00	181 00	181 00	96 50	94 50	–	39 00	41 00	25 00	23 00	15 00	–	515 00
Marshfield,	251 00	145 75	145 75	79 50	30 00	10 75	15 00	15 00	27 50	7 75	5 00	–	336 25
Barnstable,	177 00	44 70	44 70	39 00	26 86	–	9 00	–	9 00	6 00	6 00	6 00	146 56
Nantucket,	134 00	11 00	11 00	36 00	22 25	–	10 00	–	7 00	1 00	–	–	121 50
Martha's Vineyard,	162 00	75 59	75 59	61 75	8 55	17 75	12 00	2 00	16 50	5 00	2 50	2 50	204 14
Totals,	$4,882 00	$3,122 29	$3,069 70	$2,462 75	$838 61	$224 05	$518 75	$388 50	$380 85	$231 15	$164 55	$62 20	$7,745 41

Analysis of Premiums and Gratuities Awarded — Concluded.

MISCELLANEOUS.

SOCIETIES.	For Agricultural Implements.	Offered for raising forest-trees.	For experiments on manures.	Amount awarded for objects strictly agricultural not already specified.	Amount awarded and paid out for Trotting-Horses.	For objects not strictly agricultural; domestic manufactures, etc.	No. of persons who received premiums and gratuities.
Massachusetts,	–	–	$1,500 00	$2,300 00	–	–	–
Essex,	$55 00	$30 00	25 00	–	–	$298 00	346
Middlesex,	6 00	50 00	–	170 00	$950 00	139 25	238
Middlesex North,	12 00	–	–	–	–	41 62	332
Middlesex South,	19 00	60 00	–	25 00	800 00	111 50	176
Worcester,	50 00	22 00	–	–	590 00	28 00	163
Worcester West,	40 00	30 00	10 00	–	645 00	68 75	258
Worcester North,	–	25 00	–	23 00	101 00	112 50	170
Worcester North-West,	13 50	30 00	–	–	595 00	133 75	209
Worcester South,	–	35 00	–	–	555 00	115 00	133
Worcester South-East,	10 00	30 00	–	–	–	48 65	336
Hampshire, Franklin & Hampden,	23 00	20 00	–	–	935 00	60 00	141
Hampshire,	46 50	16 00	–	–	245 00	119 50	175
Highland,	7 00	–	–	–	53 00	74 50	205
Hampden,	46 00	15 00	–	–	85 00	25 75	89
Hampden East,	8 25	25 00	86 00	–	150 00	56 35	100
Union,	1 75	–	–	30 75	74 00	38 50	157
Franklin,	6 00	10 00	5 00	–	–	120 25	245
Deerfield Valley,	10 50	–	–	–	100 00	65 35	262
Berkshire,	47 00	–	–	–	–	643 00	650
Hoosac Valley,	19 00	–	14 00	22 00	825 00	264 25	318
Housatonic,	12 00	–	24 00	–	544 00	345 50	412
Norfolk,	–	40 00	6 00	6 00	300 00	75 00	212
Hingham,	–	50 00	–	7 05	–	231 25	238
Bristol,	35 00	30 00	60 00	–	1,720 00	437 00	557
Bristol Central,	–	–	–	1,370 73	1,271 00	250 27	268
Plymouth,	4 00	60 00	–	20 00	1,035 00	259 35	970
Marshfield,	19 75	50 00	–	20 00	–	175 65	637
Barnstable,	–	7 00	12 00	13 25	50 00	148 83	282
Nantucket,	–	21 00	16 00	5 00	–	107 60	101
Martha's Vineyard,	–	17 00	–	1 00	14 50	127 96	233
Totals,	$491 25	$673 00	$1,758 00	$13,013 78	$11,637 50	$4,722 88	8,607

SUMMARY.

In the report for 1874, I gave a brief *résumé* of the financial condition of the various societies, together with an analysis of the various operations of the year, as presented in the returns made to this office. The figures proved so interesting and suggestive, that I venture to present a similar summary for 1875.

It is a curious fact, that although the weather was bad on most of the days of exhibition of the societies, throughout the State, and, consequently, unfavorable for a large attendance from the crowds who usually flock to the agricultural shows, as a recreation, and who are generally supposed to be the reliance of managers for filling their treasuries, the total receipts of the societies were, in 1875, considerably in excess of those for 1874, the aggregate being, for 1875, $149,837.58, while, in the year before, they were $132,842 60.

If we remember that the amount received from the state treasury, in the way of bounties, was about the same in both years, that the income from the permanent fund was greater in 1874 than in 1875, that the receipts from new members and donations were also greater in that year, we conclude that the difference in the aggregate receipts must have been, almost entirely, from what is known as "gate-money" or admission fees.

The exact difference in figures between these fees, allowing for the difference in the other items of receipts, is $12,135.35. That the societies should, under such unfavorable circumstances, have so favorable a showing, is, indeed, a matter of congratulation.

The weather was certainly not the kind most likely to have drawn out a "horse crowd," and this fact furnishes another point to those who do not believe that the horse-trot is at all requisite to the success of the agricultural fair.

The "premiums offered" were in about the same proportion to "premiums paid," in both years.

The current expenses of 1874 were less than in 1875 by $13,967.84, but this difference is accounted for by the unusually large expenditure, by the Worcester North Society, of $13,399.61, above the premiums and gratuities.

The total disbursements for the year were $144,892.79, or less than the total receipts by $4,944.79, while, in 1874, they were less than the receipts by $6,533.43.

The indebtedness of the societies has increased within the year $23,682.35, but the value of the real and personal property belonging to them has increased in a much greater ratio, being valued at $749,862.88, while, in 1874, its valuation was $546,753.03, a difference of $203,109.85.

The above facts and figures certainly show that our county societies are in a flourishing condition, and that they are judiciously managed.

I append a table of figures, comparing the financial *status* of the societies in 1865 and 1875: —

YEAR.	Am't received from Commonwealth.	Total receipts for the year.	Premiums and gratuities paid.	Total disbursements for the year.	Indebtedness.	Value of real estate.	Value of personal property.
1865, ...	$13,800 00	$60,865 03	$16,938 08	$40,649 17	$56,979 73	$197,639 14	$36,632 61
1875, ...	17,923 47	149,837 58	45,429 43	144,892 79	209,210 91	629,476 92	120,385 96

YEAR.	Am't paid for farm improvements.	Am't paid for live-stock.	Am't paid for farm products.	Amount for all other objects not strictly agricultural.	Proportion of am't of premiums paid to those offered.	Proportion of premiums paid to total receipts.	Number of persons who received premiums and gratuities.
1865, ...	$1,011 50	$9,159 60	$3,212 48	$2,326 73	About $\frac{2}{3}$	About $\frac{11}{25}$	4,850
1875, ...	1,267 25	19,076 08	7,745 41	4,722 88	About $\frac{9}{10}$	About $\frac{3}{10}$	8,607

ABSTRACT OF RETURNS

OF THE

AGRICULTURAL SOCIETIES

OF

MASSACHUSETTS.

1875.

EDITED BY

CHARLES L. FLINT,

SECRETARY OF THE STATE BOARD OF AGRICULTURE.

BOSTON:

WRIGHT & POTTER, STATE PRINTERS,

79 Milk Street (corner of Federal).

1876.

PREFACE.

The returns of many of the societies receiving the bounty of the Commonwealth continue to be far below a reasonable standard of value and usefulness. Instead of an honest effort to make an adequate return, in the shape of information that would be of great service to farmers in all parts of the State, one would infer from a careful examination of the "Transactions," that the chief effort was to see how close a bargain could be driven with the State, just grazing within the letter of the law, and totally disregarding its spirit. This is not the kind of service the Commonwealth expects the societies to render. It is not what could be called "fair" among business-men. The State Board of Agriculture, in requiring the societies to make their returns in print, contemplated something more than a bald list of premiums awarded, and the offers of prizes for the coming year. Such a return is of no earthly use or interest beyond the limits of the society, and is of the least possible value even there.

Attention has been called to this deficiency many times, but my suggestions appear to have been entirely disregarded by a large number of the societies, for, instead of any improvement in the value and quality of the annual volume, there is a manifest deterioration; no effort being apparent to furnish any information to the farming community; no statements of experiments, or of processes, or of the reasons for awards by the committees, being presented. No set effort to see how little of valuable information could be furnished, could be more successful. As long as this spirit prevails, the reputation of the societies must suffer, since it indicates a low-toned sense of duty; I might almost say, of common honesty. The bounty of the State is given, not to be frittered away in twenty-five-cent premiums, but to call out and diffuse information, and to add to our present stock of knowledge.

I am indebted to J. D. W. French, Esq., of North Andover, for the illustration of his Ayrshire cow, "Rose," which appears as the frontispiece of the Report. She is numbered 743 in the Ayrshire Herd-book; in color, dark and white. Calved, May 7, 1864. Sire, "Souter Johnnie" (71); dam, "Tulip 2d" (210), by "Rob Roy" (58); grandam, "Tulip" (209), by "Oswald" (51); great-grandam, "Tulip" (imported, 1855).

"Souter Johnnie" (71); sire, "Blossom 2d" (11); dam, "Kitty 4th" (117), by "Dundee 5th"; grandam, "Tibby 2d," by "Wallace" (imported); "Tibby," by "Rob Roy" (imported); by "Daisy," by "Rob Roy" (imported); by "Daisy" (imported, 1839).

Statement of milk for 1874–75. The record begins October 5th, and continues for three hundred and twenty days, the whole time in milk. Total yield in pounds, 8,409. Total yield in quarts, 3,911.16. Average yield in pounds per day, 26.27. Average yield in quarts per day, 12.21+.

CHARLES L. FLINT.

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Secretary—CHARLES THACHER, 2D, of Barnstable.

NANTUCKET.

President—ANDREW M. MYRICK, of Nantucket.
Secretary—ALEXANDER MACY, JR., of Nantucket.

MARTHA'S VINEYARD.

President—HENRY L. WHITING, of Tisbury.
Secretary—B. T. HILLMAN, of Chilmark.

AGRICULTURAL EXHIBITIONS—1876.

ESSEX, at *Danvers*,	September 26 and 27.
MIDDLESEX, at *Concord*,	September 28, 29 and 30.
MIDDLESEX NORTH, at *Lowell*,	September 26 and 27.
MIDDLESEX SOUTH, at *Framingham*,	September 19 and 20.
WORCESTER, at *Worcester*,	September 21 and 22.
WORCESTER WEST, at *Barre*,	September 28 and 29.
WORCESTER NORTH, at *Fitchburg*,	September 26.
WORCESTER NORTH-WEST, at *Athol*,	October 3 and 4.
WORCESTER SOUTH, at *Sturbridge*,	September 14 and 15.
WORCESTER SOUTH-EAST, at *Milford*,	September 26, 27 and 28.
HAMPSHIRE, FRANKLIN AND HAMPDEN, at *Northampton*,	October 5, 6 and 7.
HAMPSHIRE, at *Amherst*,	September 26 and 27.
HIGHLAND, at *Middlefield*,	September 14 and 15.
HAMPDEN, at *Springfield*,	October 3 and 4.
HAMPDEN EAST, at *Palmer*,	September 21 and 22.
UNION, at *Blandford*,	September 20 and 21.
FRANKLIN, at *Greenfield*,	September 28 and 29.
DEERFIELD VALLEY, at *Charlemont*,	September 21 and 22.
BERKSHIRE, at *Pittsfield*,	October 3, 4 and 5.
HOUSATONIC, at *Great Barrington*,	September 27, 28 and 29.
HOOSAC VALLEY, at *North Adams*,	September 19, 20 and 21.
NORFOLK, at *Readville*,	September 28 and 29.
BRISTOL, at *Taunton*,	September 26, 27 and 28.
BRISTOL CENTRAL, at *Myrick's*,	September 13, 14 and 15.
PLYMOUTH, at *Bridgewater*,	September 20, 21 and 22.
HINGHAM, at *Hingham*,	September 27 and 28.
MARSHFIELD, at *Marshfield*,	October 5, 6 and 7.
BARNSTABLE, at *Barnstable*,	September 19 and 20.
NANTUCKET, at *Nantucket*,	September 6 and 7.
MARTHA'S VINEYARD, at *West Tisbury*,	October 3 and 4.

AGRICULTURE OF MASSACHUSETTS.

STABILITY OF AGRICULTURE.

From an Address before the Worcester Agricultural Society.

BY DANIEL NEEDHAM.

Looking around you to-day, you see your lands almost as verdant as in the month of June; the fruits of your harvest filling barn and store; your cattle thrifty and in excellent condition; and your homes happy and abundantly supplied, not only with the necessaries, but the luxuries, of civilized life.

But as you cast your eyes from your agricultural to the manufacturing districts, you find the water low in the rivers and streams that turn the wheels in the heretofore busy mills, and the owners making no complaint; they are willing, in fact glad, that it is so, for it gives them an opportunity to diminish the supply of manufactured goods, which already are piled high in the warehouse and the factory, and for which there is no demand.

You find an uprising of hundreds and thousands of idlers,—men, women and children; some almost on the verge of starvation,—either unable to get work, or refusing to work on reduced time or at reduced wages.

Looking still farther, you find merchants in New York, Chicago, Boston, Baltimore — everywhere throughout the country — feeling the depression of business to an extent not experienced before by men of this generation, with salaried clerks who are earning them no money, with large rents which are eating rapidly into their capital, with debts due

them difficult to collect, and due from them equally difficult to pay; some on the verge of bankruptcy; many already having, either voluntarily or involuntarily, taken the fatal plunge; a multitude anxious day and night, fearing that an honored name and an honored life will terminate in this long-dreaded disaster; and not five in a hundred who are to-day in as good financial condition as they were two years ago.

This is no overdrawn picture. Repulsive as it may be, unencouraging as it is, the facts making this record stand forth so boldly and clearly, that they are easily read of all men.

While this great tidal wave is still rising and continues to devastate the land,—although you as farmers are not engulfed by it, and perhaps feel it only by the awakening sympathy which distress in others always creates in the human breast,—yet, as citizens of this great and heretofore prosperous country, interested in all its weal and woe, it is your privilege and duty to inquire and know the cause, that a repetition of the disaster may not come from an ignorant repetition of the causes which have created this.

It is a satisfaction to know that this condition of trade, manufacturing and general business, has been in no degree aided, stimulated or provoked by the legitimate farmers of the country. They have had no share in the causes which have conspired to produce this storm, which commenced with the failure of the great banking-house of Jay Cooke & Co., and has continued to increase and augment in spite of repeated fair-weather predictions, and to-day, so far as human observation can discern, is quite distant from the culminating period of its history.

In fact, it is not saying too much when it is claimed that the only impassable wall which this tidal wave cannot overleap, is the barrier which the business of legitimate agriculture has erected; and whatever may be saved to the manufacturer and to the merchant, will be preserved largely by the industry, the skill, the intelligence and the frugality of the men and women who have been devoted to the varied pursuits of agriculture.

In the early history of the Rebellion, there was great depression in business. Men throughout the country were

everywhere taken by surprise. An event, though occasionally predicted, was actually upon us, and a stagnation and paralysis, as the result of the general alarm and consternation, succeeded.

The intelligence of our people, however, speedily enabled them to adapt themselves to the necessities of the case. Thousands, and tens of thousands, and hundreds of thousands of men were called from the productive industries of life to engage in the duties of the soldier. Two immense armies were gathered upon American soil, each struggling for the mastery; one determined to destroy, and the other equally determined to preserve, the government. The producers, South as well as North, had been largely drawn upon to make up the antagonistic forces.

The products of labor at once fell off, simply because the producers were so few and the consumers so many. Prices advanced and continued to advance, until at one time it seemed as though no limit could be put upon the price of merchandise. Manufacturers realized fortunes; ordered new machinery; increased the number of their mills with marvellous rapidity; and yet the price of cottons and woollens, and the other necessaries of life, continued to advance. The merchants, in like manner, doubled and trebled the price of goods on hand, but the demand was apparently inexhaustible. Orders succeeded orders by express and telegraph, until an actual frenzy pervaded the business community, and mills were built and goods manufactured as though the war was to continue forever, and as though a million of men engaged in its prosecution were forever to be consumers, and never again producers.

So excited was trade, and so universally were prices sustained and increased, that no dealer could buy a pound of cotton or wool, or a yard of cloth, or a wooden pail or chair, a cheese or a tub of butter, or any other article which was the product of labor or skill, without realizing a large and illegitimate compensation for the capital employed, or the time occupied in the transaction.

During a great portion of this time the existence of the government was so greatly imperilled, that its promises to pay dropped to a fearful discount. Gold, the world-accepted standard of values, was at a fabulous premium, reaching, in

the height of the financial excitement, to more than one hundred and eighty per centum premium.

Among these wonderful changes and fluctuations, however, farms shared but little. A farm in the average Massachusetts towns represented in its sale no more paper money than it did when paper money was not at a discount, and gold and silver commanded no premium.

From that day to this, saving and excepting the actual increased value of farms by improvements made on the lands, the fences and the buildings, there has been little change in their market value. When one hundred dollars in gold was worth two hundred and eighty dollars in paper money, no perceptible increased price was either given or offered for your lands; they held the even tenor of their way, while the products of your skill and industry as farmers shared to an extent in the general rise.

This sharing in the general rise was a clear net gain without a drawback, as your lands to-day are as valuable as before the days to which I have alluded. All other kinds of business have had blows so severe as to absolutely paralyze them; yours goes on in the old way.

So far as this gain was made in the farming towns, it represented the absolute net gain which the industry, thrift and frugality of the people had enabled them to make, and a large portion of which they will be able to maintain under the most adverse conditions of trade.

During this period, the immense stimulus given to manufacturing and trade was like a train of cars under full headway on a down grade, with full steam working, and the descent of the grade constantly increasing. When the Rebellion ceased, and the men who had so nobly fought for the government, or so vainly and foolishly fought to bring about its ruin, returned to their homes, the mills kept on going; trade continued; not even the brakes were applied; neither was the steam shut off. New mills that were in process of building were finished and put to work, and other new ones were built and set in operation, until, if possible, the business of the country magnified and grew as though no limit could be reached in the supply, and the demand could never be met.

As the regiments disbanded, many of the men who were formerly workers and producers entered into trade and speculation, increasing the great army of non-producing men to a wonderful extent.

All at once business, like a train of cars under full speed, reached a rotten bridge, and the train was ditched. Jay Cooke's failure brought the business community to a realizing sense of its condition. It was not Jay Cooke's failure that ruined the country, or that brought ruin upon the country; but it was that failure that stopped this mad career of speculative enterprise, and turned the current of thought in a healthier direction.

While the manufacturers had been amassing fortunes, and the merchants had surrounded themselves with princely luxury by their speedily-made gains, an element of life, always found in every community, had been developed to a most unhealthy and portentous extent.

Every man's pocket was overflowing with money. The mechanic had trebled his price of labor; the operative in the mill and the shop had approximated the mechanic, and the ordinary laborer, who toiled from day to day without thought or skill was commanding two or three times his legitimate earnings.

Great leaders in finance started new lines of railroads through unpopulated districts of country, bought coal lands, sunk oil wells, established and opened copper mines; and men who were never heard of in finance imitated their example, by incorporating companies for the manufacture and sale of patent articles and patent rights, until, in fact, the only class of producers left, whose labor was really needed and absolutely useful, was that of the farmer, miner, artisan and mechanic.

The press, by its wide-spread influence, carried this spirit far and wide, until it permeated every town and school district in the country. The religious press, with its great influence, published the advertisements of these great leaders in scheming finance, and thousands whose legitimate gains might have been a blessing to themselves and their children, were influenced to part with their money and accept therefor worthless pieces of paper.

Jay Cooke's name, which had been so honorably connected with the sale of the government bonds, and which had enabled him, on the reëstablishment of confidence, to secure a great hold on the people, was used to found schemes which were more visionary than bubbles, and as unreal as the wildest dream.

The press not only published these alluring advertisements, but, from the most mercenary motives, called attention to them in their editorial columns, and under the guise of honest opinion, represented Northern Pacific and other worthless bonds as safe investments, until thousands of innocent readers, not thinking that base purposes inspired these finely-written articles upon "Northern Pacific Bonds secure as Governments, and yielding a much larger income," put their hard-earned savings into these pieces of handsomely printed paper, and discovered no fraud until the great bubble became so extended and thin that it burst from its inside pressure.

Though railroad bonds are worthless; though the legion of copper and oil companies have passed so far into history that their names are scarcely remembered; though manufacturing stocks have greatly depreciated and many of the companies become bankrupt, your farms have not depreciated, and the quiet of your homes, if you adhere to your agricultural industries, has not been disturbed.

Among the evils yet remaining of this wild infatuation, is the enormous debt which has been created, and which still remains.

I do not refer to the government debt. That was a necessity, is well cared for, perfectly secure, and in process of gradual and certain payment.

I do not refer to debts created by States and towns, in providing bounties to encourage men to enlist, and to provide for the families of enlisted men. This was sound political economy, as it rapidly increased the strength of the government, and lessened both the slaughter of men and the period of the war.

But to the rapid growth and increase of town, county, State and corporation obligations, in the prosecution of improvements which have been fostered or hastened by a spirit of speculation, emulation or pride, which has fastened upon a

future generation liabilities which should not have been made, or if made, should have been promptly met. School districts and fire districts, religious societies, railroads, and almost every other corporation, have shared in these acts, which have too largely anticipated future necessities, and too largely ignored the lack of ability which a future generation may have to cancel obligations which we have assumed for them, in addition to those which will develop as necessary for their own comfort and security.

But the public mind is called off from the real to an imaginary cause of the present great disturbance. Instead of finding the cause in these large sums borrowed,—in these wild speculations already culminated, or rapidly culminating; in expenses beyond means, and in receipts for *labor* which *labor* never earned, and never could legitimately earn; in a continuation to create a supply for a demand which *long since* ceased to exist; in an exaggeration of values, and in a total disregard of the natural relation between labor and value,—it has been found in the administration of the national and state governments; in an excessive issue of paper money; in the establishment of national banks; in the high price of gold; in the tyrannization of capital over labor; in everything except the one and only cause of the trouble,—the extravagant indulgence in the use of money which only an extraordinary and abnormal condition of the country enabled the people to obtain.

The trouble must continue until the equilibrium is restored, and the unnatural price of labor reduced to its normal condition, by a demand which will in i s turn call for a supply, and which, in the creation of that supply, will reëstablish legitimate compensation for labor.

But we have two great evils produced by this abnormal condition of the country, which the people may well regard with deep anxiety. One is the general extravagance which a very large portion of our countrymen at the North have and still continue to indulge in. The very air is poisoned by wastefulness. It has crept into homes where heretofore there has been the most rigid New England prudence; it has entered towns where extravagant buildings have been erected; it has entered legislatures where offices have been multiplied

and salaries increased; it has gone with the young man and maiden to the school and to the academy; and the mark of the Puritan character, as made by examples of strict prudence, which in our ancestors entered into every department of domestic, social and public life, has been almost obliterated. While, in turn, the former wasteful and extravagant South, from sheer necessity, has been taught a lesson of great economy. This generation of young men and women there has been inured to hardships, to severe trials, and to continual dependence upon their own efforts. In fact, the original habits of the New Englanders have to a large extent been lost sight of, and have been adopted unwillingly by our brethren in the Southern States. That this change will work favorably to them, there can be no doubt. That with their rich soil and kindlier climate, it will soon supplant poverty by plenty, and scarcity by abundance, there can be no doubt. If we cannot get back to the old ways, we may well fear for the old thrift.

The second great evil is in our enormous indebtedness,—the creation of debts which we have little disposition to pay, and which nothing but a want of New England prudence would have allured us into creating.

The largest government indebtedness was reached in 1866, when no less an amount than twenty-seven hundred and seventy-three millions of dollars constituted the indebtedness of the nation. More than six hundred millions of that debt has already been cancelled. Looking from this national debt to state and corporation indebtedness, we find that in 1875, these liabilities are ten times as great as they were nine years previous, and that, instead of diminishing, these liabilities have been rapidly augmenting. It is not certain that these liabilities are not still on the increase. Until they cease to augment, and until the people, from their legitimate industry, begin their cancellation, all hope of a vigorous prosperity must be abandoned.

It is a fallacy to suppose that you can pay one debt by creating another, or that you can satisfy a first promise to pay by substituting a second.

Congress long since closed up the construction account of the national government; let the people, in their civil and

individual capacity, establish the limit of all minor corporation indebtedness.

Debt may not be regarded as a positive evil until it becomes a burden; and then, unless circumstances are fortuitous, it will ultimately break down the party or the corporation struggling to carry it.

In the United States, during a period of ten years, nominal property, representing thousands of millions, printed in the form of stock certificates, faded out of sight; and more than five hundred millions of railroad bonds have failed to pay the interest on the debt they represent, and could be bought in the open market at a fifth of their nominal cost.

Looking back upon this shameful waste and prodigality, is it a matter of wonder that business is dull? Looking back upon this speculation in oil wells that never were sunk; in copper mines that were never explored; in railroads that never were half built, or if built could secure no legitimate business; in towns and counties laid out on expensive maps, but which had no inhabitants; in western school-house and court-house bonds, when neither school-houses or court-houses were ever constructed; in coal mines that were never opened; in silver mines that were never found; in inventions and patent rights which were the products of an ill-balanced mind;—it is a marvel that when the shock came it did not produce complete revolution and ruin.

The explanation can only be found in the vast army of farmers occupying their two hundred millions of acres of improved land, and producing not only bread and meat sufficient for home consumption, but a surplus to aid in employing the merchantmen on the high seas, and to secure an influx of foreign gold to aid in increasing the value of the currency, and in the mechanics, artisans and miners whose constant and steady industry created vast wealth to aid in preventing an absolute depletion of the national treasury.

The national government has set the first example for reform. Cutting down salaries, and investigating with the most rigid scrutiny every department; at the same time providing means for diminishing its debt. Had the national government continued, as did the people in their private and

corporate capacity, to swell the volume of indebtedness up to the time of the crisis produced by the failure of Jay Cooke & Co., it is difficult to judge of the immensity of the ruin.

But here are the agriculturists of the country, with their capital invested in their lands and barns and houses, unimpaired, and with prices for all the products of the soil, and the farm fully up to an average of any ten consecutive years, excepting always years of an abnormal character. Men dealing in merchandise, who perhaps at times have been envied in their apparent prosperity, now compromise with their creditors by paying a fractional part of their liabilities. Manufacturers, whose wealth rapidly increased by sudden and great demand for their goods, now find the high price of labor which the unusual demand established, the high rates of insurance and interest money on a large stock of made up, unsalable goods, and on a large investment in buildings and machinery, eating up, not only the profits of former days, but the capital invested in the original business, and are obliged to borrow money to bridge over an uncertain period of time, which without an ability to borrow would precipitate ruin.

Dealers in city and town lots have also shared in this great depreciation, and in New York City the shrinkage in real estate has been from thirty to thirty-three per centum.

During all this time, the agriculturists of the country have not only stood their ground, without failures, without bankruptcy, but with an absolute net gain. They have heard the noise of the shock of the great contest; they have seen speculators, bankers, merchants, manufacturers falling to the right and the left, as reason was restored and the ability of men to pay their promises was scrutinized; and they, almost alone, as a class, have escaped injury, and, I might add, inconvenience.

It was so in the long depression of business from 1837 to 1842. It was so in the great depression which preceded the famine in Ireland, when the surplus products of American agriculture gave employment not only to American but foreign vessels, and brought back in return from Europe the gold and silver which the extravagance of the American people had sent abroad in exchange for silks, laces and fine cloths. It is no new thing for a nation to be saved by its intelligent, industrious agriculture.

In spite of our unwillingness to accept books, schools and colleges as aids, we have largely accepted them; and in reviewing the past, we can see how many wild lands have been reclaimed, how many swamps have been made productive and healthy, and how many barren hillsides made to blossom as the rose, through the means forced upon us by men of deep scientific research.

The time has already come when the keenest intellect, the most varied learning, and the greatest mechanical skill are recognized as absolutely necessary for the attainment of the highest type of American farming.

If the country recovers from the shock of this depression, it will be indebted to its agriculture, North, South and West, If it recovers speedily, it will be indebted to the strong latent power of these same influences.

Already the eastern horizon glimmers with the light of improvement. The United Kingdom, from a combination of causes, will have cereals enough of its own production for less than half a year's supply; the balance of the supply must come largely from the United States, for the great cereal lands of the Baltic have produced no surplus product for exportation.

In the year 1874, one hundred and fifty-nine cargoes of grain were exported to foreign shores; this year, already, we have forwarded nearly three hundred; and this is less than half of what will be demanded; yet America is fully equal to supply the wants of half-starved Europe.

What answer, then, shall we make to the anxious merchant, manufacturer or operative? Go to the Land. It is the source of original supply; it is the place of last resort.

As the father welcomed the prodigal son, who, not content with home, wandered off to do better, and fared worse, so the land welcomes all these sons and daughters who have wandered off to the crowded city and the mill, back to its kindly protection.

How the manufacturers who have established mills and furnished them, in excess of a natural demand, are to adjust the balances so as again to employ all their machinery, is a problem which time alone will work out. Some foreign demand will, undoubtedly, spring up, and American genius

will find its ability equal to successful competition in a new field.

The lesson of prudence and frugality which the life of a farmer always teaches, is the one which the panic has brought home with great force to the American merchants and manufacturers.

Well may the farmers gather at these annual festivals, and look over the productions of nature which their intelligence and skill have greatly improved and made useful. Well may they rejoice that the products of their industries supply the wants of millions at home, and give employment to commerce in transporting surplus products to the hungry and needy on a foreign shore. Well may they feel that while the soldiers who so nobly and fearlessly fought for the old flag, saved the political life of the nation in the time of the great Rebellion, they have, by close attention to their business, and by the frugality and prudence of their lives, in no small degree inspired confidence in the government, and saved it from financial ruin.

SOME OF THE POISONS OF THE FARMER'S LIFE.

From an Address before the Hampshire Agricultural Society.

BY EDWARD HITCHCOCK.

In our cold and variable climate, specially acting upon our acutely nervous temperaments, we are quite sure to secure animal and artificial heat enough, even if we do it at the expense of purity of the air. If we sleep cold, we are sure to wake and pull on an extra blanket. If we are too cool when we sit down in our houses, the first thing is to shut the window. And the patient lungs will endure a wonderful amount of this abuse. Though they fill and empty better when the air has its proper amount of pure oxygen, yet they will pump on harder and harder when the purity of the air is more or less diminished, for they must do their part to supply the necessary waste. In this centennial year it is proper to praise anything that is old. Then, I say, Hurrah for the old-fashioned fireplace, with its big blaze of flame and coals! Hurrah for the plenty of fresh air which it *compelled* in every house! Are we to suppose that the young or old people in 1775 suffered any more in their persons from the cold, or were obliged to dress any warmer, than we do now? For the purer and more plentiful the air, the greater the animal heat.

Not farmers only, but most other people, nowadays, make their houses as close from air as possible, build smaller chimneys, put a red-hot furnace in the cellar, stop up every hole, and have now got to the Yale lock, where there is not even a key-hole for the air to escape or enter; and with a little effeminacy, the result of increasing luxury everywhere, and

too often the delicate habits of the female portion of the family, but precious little fresh air is admitted to the house from November to April—about one-half of the year.

And how about the sleeping-rooms of many of our farmers? Is it not fair to say that the average New England farmer and his wife sleep in a bedroom on the lower floor of the house, fifteen feet one way, twelve another, and seven or eight feet "between joists," and opening into the kitchen? Perfect ventilation requires that 3,000 cubic feet of fresh air should be supplied to each person per hour, and sleeping-rooms should allow 1,000 cubic feet of space to each occupant. Now the bedroom just mentioned contains less than 1,500 cubic feet of space, and how is this for breath capacity for two persons? To be sure this room opens into the kitchen, and thus gives some more air, but what kind of air would you expect to find in a room at the end of an evening where the whole family has been gathered, and where possibly some cooking has been going on at the same time? And does the farmer, or she, the good wife, usually take pains to ventilate the room just before going to bed?

But now, in spite of this dreadful state of things, some, yes, many people, do raise a family, rear the children to manhood and womanhood, and how is this about ventilation, if you do violate a law of nature? So the Esquimaux eat and relish for a dessert a pound or so of tallow candles. Some Chinese feed on worms, not quite so fat and large as our tobacco worms; and still I believe there is better food even for them than are these.

And on the other hand, sometimes the wife begins to go down hill with consumption, a child dies in convulsions, by pneumonia, cholera morbus or infantum, and then at the funeral there is a wonderful submission to the will of the Lord at this most mysterious dispensation of Providence, when the real thing submitted to has been the foul air of the sleeping and living room or past months or years.

There are some gases almost instantly fatal to life. Carbonic acid is one. But physiology tells us that there is no poison so fatal to the human race as the exhalations of the human body itself. Carbonic acid probably kills by keeping away the oxygen from bodily tissues; but the decayed,

impure and poisonous vapors cast off by our own bodies, not only crowd the pure air out, but convey directly back into our bodies this fermenting poison of decay and death.

Another point of interest concerning the purity of the air is the location of it. I mean its position nearer or farther from or under the surface of the ground. Analysis of the air, chemical and otherwise, shows most conclusively that near and under the surface of the ground it is much more injurious to the health of man than that several feet above it. Hence the lower story of most of our dwelling-houses, and especially that of our old-fashioned houses, which merely "squat" on the ground, is not a suitable one for sleeping-rooms. I fully believe that not an inconsiderable amount of rheumatism, *the* disease of farmers, would be done away with if people would sleep in the second story of the house. But hear what a sensible woman says on this point.

"If every farmer in the land could be made to see that the miasma which floats invisible in the upholding sunlight of noonday is precipitated by the chill of night, just as the earth in a glass of muddy water goes to the bottom when at rest, and that he, sleeping on the ground floor is aptly represented by a pin lying in that layer of mud, he would conquer his aversion to going up-stairs, and once having tasted the superior charms of a fresh, airy bedroom, away from the smoke and the smells of the roasting and broiling and frying and baking which must be done in every kitchen, he would never be induced again to sleep below stairs."

Another of the poisons of the farmer's life is pork—P-O-R-K! Webster defines pork as "the flesh of the hog, fresh or salted, and used as a food." Perhaps a definition of pork ought to read something like this: Pork is the diseased adipose tissue or fat of the American hog. It is the more and more diseased, and hence richer in flavor for food to men, as the animal is allowed to live on the rotten and filthy excrements of man and beast, and to eat all the indigestible and refuse food which no other animal will eat, or smell of but once. If the food called swill is fermented by putrefactive decomposition, the hog is more greedy to get it, and envelops himself all the more deeply in the luscious and delicious fat. Exercise, sunlight, fresh air, cleanliness

and healthy diet, are not the proper food for fat stuffs. The confinement in barn cellars, darkness, close pens, filth, the refuse of slaughter-houses, glue factories, and dirty manufactories, give a richness and dainty flavor to the articles of human food known as bacon, ham, lard, sausages, salt pork, head cheese, liver, and so on. The hog is the nest or generating place of the trichina and the elegant tape-worm, which ultimately take up their residence in the bodies of men and women. He is also the source of lard, or the diseased fat reduced to a soft solid and used extensively in cookery to prepare the common but innutritious piecrust. Lard is also of constant use in the frying-pan—an American delight. Its great value here is that it boils at so high a temperature when food is cooked in it that the tender and juicy albumen is dried up and greatly injured, but at the same time the delicate flavor of the diseased fat is all the more brought forward.

If, now, any one complains that this is no photograph, but an artistic sketch and highly colored in some respects, it is certainly safe to say that fully one-half the hogs in New England are no better off than in the character just given them.

But the farmer says: "What shall I do? It costs but little to raise hogs; they help greatly to work over manure, and furnish food for my family for a large part of the year. I can't afford to live unless I raise hogs." The answer to this is somewhat radical, with present information on the subject, but it points to an end which the laws of God compel us to consider; and this is, to use none of this "unclean" animal for food, but in place of it use much more the natural ripe cooked and uncooked fruits of the earth. Perhaps you must have one or two hogs to use up certain kinds of refuse and to turn over the excrements of the barn-yard. Very well, do it. But make your pigpen at least three times the distance from the top of your well of drinking water that it is from the top to the bottom of the well. Then make or have a shed near by, where a quantity of dry loam can be constantly kept, and daily (during summer and early autumn) let enough of this loam be "cast before the swine" to absorb everything like liquid or moist manure or filth. This, with an occasional removal of all the contents of the pigpen to the compost heap, and you have the best antidote to one of the farmer's

poisons. "But what shall be done with the pig"? Why, at any time you please, kill him. "And what then"? Don't carefully scrape, scald, clean, and put inside of salt in barrels, down in your cellar, his worthless carcass, but cut him into inch pieces, bones and all, and put a large bucketful of them down deep among the roots of your grape-vines. Give every pear and apple tree a good dinner of the same. Feed currants and gooseberries also, and if you get more than you can use in this way, prepare holes in your ground with this fertilizer, where you can plant next year some more fruit-trees.

Oh, if we only would increase the use of home-raised fruit in our food! Use it ripe, cooked and uncooked, a great deal more than we now do! If we only would substitute for fried salt pork, sopped bread, boiled pork, doughnuts, and the everlasting piecrust of lard! If we only would take in their place potatoes, with milk, cream or butter, cooked apples, stewed, dried and fresh fruits! If we only would begin the season with, and use much more largely, fresh and uncooked fruits at every meal, beginning in June with strawberries, and ending in November with grapes! Could not all this be done with precious little outlay to you, gentlemen and ladies? If it were very generally done, then we could predict the farmer's millenium as not far distant.

And how would the mothers and sisters meet the change in their daily work? Would they not prefer to go into the garden and pick, and even on some farms help to cultivate many of the fruits, rather than roast themselves over a kitchen stove in the stench of the frying-pan? And the raising of more fruit of all kinds, which I am sure almost every farmer can double in quantity, is not of interest simply for your own food. Our mechanics, trades-people, school-teachers, and other professional folk, will most happily exchange much of the pork and salt meat for fruit, when you can afford it to them at reasonable rates.

Ladies and gentlemen of this time-honored society, I beseech of you to turn your attention to raising more fruit, not only that which must be cooked, but the delicious fruit which only needs to be picked and eaten. Then our physiologists

will insure you less dysentery, less cholera infantum and majorum, fewer fevers, and, in fine, better bowels the year round.

A most reliable and sure poison for farmers is the *miasma, or poisonous vapor, generated in the refuse matter about the house and the barn.* And this is a more common and destructive poison than either of the others just mentioned. And most of our fevers are caused by the noxious exhalations, or germs, rising from decaying organic matter. Till within a few years, the air contained in the upper few feet of soil has never been brought to notice. And this does not mean simply that air is cold and damp on the ground, but that the upper few feet of soil—say six—contains much carbonic acid and other poisonous gases. A writer who is probably the first living authority on this subject, says: "A few feet under the surface there is already as much carbonic acid as there is in the worst ventilated human dwellings." Now those gases are not only out in the fields, and at a distance from the house, but they may be, and are, more or less under our dwellings, their abundance depending on the nature of the soil and the proximity of their source. And though there may be no production of them in our own yards, yet these exhalations may travel a long distance underground. In other words, there are currents and winds underground as well as above it. One proof of this is seen in the fact that in cities and large towns where coal gas is burned for illumination, it may often be perceived in a cellar where the pipes are not laid, and even where there is not a main for a long distance. Another proof is found in frozen wells, which are not uncommon. How far underground these gases may travel and enter our cellars, like demons of destruction, research has not yet informed us, since so much depends on location, the nature of the soil, and the prevalent winds above the ground; but the fact remains, that deadly gases do course rapidly through the soil, making what Pettenkofer calls "ground air," and these gases do come up under our dwellings, and produce certain diseases. These gases travel much more slowly in cold than in warm weather, since sunlight and cultivation render the soil porous and easily permeable by them. And hence we see why fall fevers pre-

vail, as the air during the summer months has been silently but continually permeating our houses, until the body is so loaded that the low, lingering fever sets in as a necessary result of accumulating poisoning.

In view of this fact, is it not a hopeless task to try to relieve ourselves of this evil, unless we adopt the Chinese custom of living in a boat, or else of going up in a balloon?

The first common-sense antidote is to carefully absorb all the animal manure or filth on our own premises by dry earth, loam or ashes. When this is done, *ventilate the cellar*. The first day in spring or late winter, when the cellar windows can be opened, then let the air course freely through it. And never, till the next early winter chill threatens to freeze the succulents, allow them to be closed. Allow the air to stir and be most thoroughly stirred in the lower stories of the house, cellar and all; and then, saving the tin-roofed garret, the other stories will be quite sure to be ventilated also. Or if the housekeeper ventilates her cellar and first stories, she will be quite apt to ventilate the chambers. "Take care of the pence, and the pounds will take care of themselves."

After you have got a good current of air regularly going through the cellar, then give it some light. Oh, what an enemy to immorality, to deadly influences of all sorts, spiritual and physical, is the pure sunlight! Let the sunlight in and through the cellar, if you would have the best protection to the wife and children at home. If typhoid fever and dysentery are preferred, then keep right on, and let alone a dark, damp and dangerous cellar. When you have let the air and light into your cellar, then aid the sun to make it lighter and sweeter by thoroughly washing the ceiling and sides with limewash (whitewash). The lime will not only protect the timbers from decay and fire, but it will destroy some of the virulence of many deadly gases. It will help, also, to find the rat-holes, the decaying timber, block of wood, vegetable, or meat—those powerful farmer's poisons.

But a more visible and odorous farmer's poison is to be found *back of the shed and the kitchen, and in the barn-yard*. Around how many farmers' buildings—clear round, I mean—can you go, this afternoon, within ten feet of them, without

holding your nose, or stepping into filth, over shoes? And yet these very sights and smells are preparing, perhaps, some of this audience for the typhoid fever, which may take a life, certainly will take all the strength of the family to care for, and possibly all the earnings for a year. A farmer, mechanic, or any other man or woman controlling a homestead in New England, is culpable, negligently culpable, if they allow a stinking cesspool, barn-yard, or anything of the sort on their premises. Such a thing is not a necessity, or even an excusable negligence. For but a small quantity of coal or wood ashes, or loam, if only perfectly dry, is a complete disinfectant for this poison; it will absorb incredible amounts.

And the absolute money profits of saving the drainage of the house is wonderful. For in most of our houses it is safe to say that, during the year, two barrels of soft soap are used and a number of pounds of hard soap. Here, then, are perhaps fifty pounds of soluble potash which are only of use to enrich the coarse weeds about the sink drain. Why not keep a barrel, or box or two, of dry earth close by the sink drain, and every morning and night let a few quarts be thrown in to absorb this most common and enriching food of plants. For I think Prof. Goessmann will tell us that all land-plants contain potash as one ingredient of their structure.

When one visits any of the older countries of the world, he is always struck with the careful saving of the drainage and waste of the house. And as it is carried about the streets in pails, as if most valuable, he is sure of a precious stench, and presumes that it will be precious food to the crops. He there sees scavengers who more carefully save every bit of excrement than does a thrifty Yankee preserve his scraps of lead, brass and iron.

But a word for the barn-yard and pigpen in this direction. If farmers fully appreciated the value of liquid manures, and the best methods of utilizing them, this matter would take care of itself. At any rate, my limited time allows me to presume this amount of information on your part. But I must do my best to enforce upon you that it is of the utmost importance to the health of the household that, during the months of July, August and September, a barn-yard with

pools of filthy liquid, and even moist contents, is one of the very best materials with which to generate autumnal fevers, diarrhœa, dysentery, and this class of diseases. And if the farmer could be sure to see to it that, once each day, all the barn-yard and pigpen waste is thoroughly covered with dry earth during the dangerous months, we are willing to insure much less of paying the doctor, and a cleaner bill of health all around. And could I also impress the fact of the money advantage in thus saving the ammonia of his manure, I am sure the physician and the physiologist have done their duty.

RELATIONS OF SCIENCE TO AGRICULTURE.

From an Address before the Essex Agricultural Society.

BY E. C. BOLLES.

To begin at a point not often touched, it must be in the power of science to render substantial benefit to agriculture, because agriculture enters nature as, in some sense, a disturbing force. The cultivation of a country is the destruction of its old balance of conditions,—the harmony established, it may be, by uncounted centuries.

When our forefathers first sailed into sight of these familiar shores, Nahant was a wooded promontory; and the Salem hills, which are so bleak and bare to-day, were rounded with the deep verdure of their ancient trees. Where dry pasture is, the damp forest mosses carpeted the ground; and streams, long since vanished or dwindled to a thread, sought the sea. The climate was less capricious; the beautiful Indian summer flung its week of misty gold into November's lap; and even the winter snows were true to their appointment of advent or departure. The pioneer's axe opened the soil to the sun, and his plough prepared the way among the stumps for the grasses and grains of the Old World. It was inevitable that all should change, as it had done in Europe and Asia so long before. The farmer here, as everywhere, was to pursue his toil in the face of difficulties of his own creating. Thoreau, in his rough Walden bean-field, expressed the general fact of agriculture: "This was my curious labor all summer: to make this portion of the earth's surface which had yielded only cinque-foil, blackberries, johnswort and the like before,—sweet wild fruits and pleasant flowers,—produce instead this

pulse; to make the earth say beans instead of grass." This struggle was complicated for our predecessors and for us by the unsparing drafts which nature had to meet.

No science can give back the past. That would be to surrender the land to be the Indian's hunting-grounds again. But it can and it must improve our agriculture by reviving such of the old conditions as will put nature more in alliance with the farmer's work. New England husbandry will never be exactly the same as that of the rich plains behind the dikes of Holland, or that whose leaves are dewy with the warm vapors of an English sky. But it will be the husbandry of a soil less sterile and more hospitable in just the proportion that the farm goes to school to science, and learns that even after years of neglect, nature may still be recovered as a friend. A wise combination of intelligence, under the direction of only what is certainly established by science now, for the purpose of recovering some of the lost values of the climate and growth, would make any district—even your own, so proud of its advanced culture—vastly more productive as well as beautiful. Economy would follow in the track of wealth and grace. The age of labor-saving machines would come to understand that the best of these are natural influences themselves.

You can see, from the special turn I give this theme, that I do not believe that the destiny of New England is to cede the hands that guide the plough to manufacturers, and to reckon, in another century, her agriculture as a lost art. I love the joy of her country-side too much; I honor too profoundly her moral and political strength in her rural communities, to think approvingly of such a change. I prefer to look for an age when sweeter compensations of rustic life shall surround the feverish excitement of our cities; when stronger attractions shall retain our youth upon the soil; when, amid richer acres and fairer homes, our farmers, who have most of all given pledges to loyalty by joining their fortunes to their mother earth, shall hold with stronger hands the tradition of liberty; but I only dare to speak of this as possible through that wide culture in which science bears its part.

Again, I specify the help which science renders to the farmer

by enabling him to meet successfully the pests and scourges let loose by the animal or vegetable world upon his crops.

The husbandman has indeed many races to run with the hosts of nature in harvesting his season's work. A myriad of unbidden guests are hungry for it; green or dry, in the bud or fruit, it never comes amiss to their ravenous jaws. Insect armies migrate across a continent, leaving a desert as they go. The air is dusty with disease to the growing grain, as sometimes with pestilence to men. Ever since the day when sacred prophecy interpreted the locust swarms as the wrath of God, agriculture has had to fight for its own. And it is here that the eager curiosity which loves to explore the forms and laws of every life, though that life may only be a microscopic point, or a noxious and loathsome thing, does good service to the cultivator of the ground. It teaches him to crush the evil in the cradle or the egg. It puts it in his power to pit one enemy against another, fighting fire with fire. It hangs upon some slender thread of habits in the movements of a depredator—the foil to his attack. Some of the classics of science, like the well-known volume of Dr. Harris here in Massachusetts, have been written in the interests of agricultural success.

Endowments from a State or nation to promote such studies —the work of individual investigators or agricultural departments—are all liable to a double misapprehension. Upon one side it seems so absurd to pension entomology! a science which may be fascinating to a few harmless zealots, with net in hand to capture, and Latin and Greek lexicons within reach to name, their victims; but which, even more than any other pursuit, impairs the popular respect for a person's sanity. It is so easy to ridicule such things, and wail for money wasted on this sand. It is not here alone that men are blind to the enlargements of their own interests. Within the last dozen years, a prominent member of our American Congress, mentioned more than once for the highest office in the people's gift, labored in his place to oppose our national coast survey, because he was a Western representative, and Illinois and Minnesota were out of hearing of Atlantic waves. As if the great West had any other highway for the exportation of her products than the sea, whose

gates were watched and guarded by the very institution which he scorned! Meanwhile the grasshopper devours a dozen agricultural departments every month, and the beetle asserts the honor of the striped uniform, by spreading terror from Colorado to Massachusetts. Surely science is worth a larger endowment than she has ever dared to beg, if she can help us here.

Another misconception comes from the old impatience of the world at the tardiness of results. To borrow a figure of a vigorous writer, we are too fond of digging up our hopes to see if they grow. We expect too much, and that too soon, from our few experiments in the cultivation of economic science. Such expectations are apt to end in the putting forward of ill-considered theories and hasty suggestions, alike dishonorable to science and injurious to the popular verdict upon its worth.

By a publication made in England while this address was in preparation, I can illustrate this branch of my subject by a noteworthy instance of a most delicate and abstruse method of research in botany, yielding the practical results which have long been sought for in the agriculture of two continents. The microscope, in its most modern and powerful form, is now in constant use for the minute examination of the invisible structure of animals and plants. Many things which live, and are powerful by their numbers, are individually only to be recognized or described under the lens. Their germs, which are smaller still, contain in their structure and development the secret of their bane or blessing to the world. It is a chamber most obscure and far removed from practical life, as your first thought might say, which is here unlocked by the optician's art. Yet the microscope has just achieved an honorable fame from the value of one of its revelations.

The potato murrain, as English authors call it, has for some time been a most dreaded pest in Europe and America. Dark spots upon the leaves; foliage and stems blackening and decaying; the tuber corrupted by the same hidden cause, and dissolving in a fetid slime; these are the well-known symptoms of the disease. The evil has been found to be a delicate white mould, whose threads mine and exhaust the plant. Such moulds are among the worst precursors of

pestilence or famine. They are more fearful than the devouring fire. They belong to a class of plants called fungi, parasitic destroyers all, the scavengers of the vegetable world. It is such a mould as you may see in autumn, at once the murderer and shroud of the flies dead upon the window-pane. Other fungi, not indeed of the special forms of mould, are the "rust" or smut of cereal crops. The remaining difficulty, after the discovery of the potato-mould, the *Peronospora*, was to understand the full process of its reproduction. Winter, in theory fatal to the life of any ordinary form or germ of the potato-fungus, only laid the chill of a brief interruption on its devastating work. There must be, so botanists say, some secret retreat of vitality, some conserving organ or seed, out of which the spring called the evil powers into activity again. The riddle has just been read by Mr. Smith, an English botanist of some repute.

In the stems and corrupting fragments of blighted potato-plants, and under the dissolving influence of the autumn rains, very small brown grains or spheres have been found, developed on the mould-threads, just as these are ready to die by frost. This is the preparation of the parasite for winter. Everything else perishes. The mould and its dead host, the potato, crumble away. The little spheres, only the thousandth of an inch in diameter, survive, waiting patiently in the frozen ground. In the spring they thaw and sprout, taking possession of other plants in the same soil. The microscopist I have named is the first to detect and expose this wonderful resource of the short-lived but destructive mould. It now becomes possible intelligently to press to extermination this pest, as others, like the vine-mould and the wheat-rust, have had their ravages curbed before.

This instance may stand for many, all teaching the same lesson. Even the most refined investigations of science may have their practical value. The steel-maker has found a help in the "bright lines" of the spectroscope, and a jury, searching for blood-stains, have learned to interpret its "absorption bands." So the farmer of the future will, in common with all earth's workers, subsidize science for protection and defence.

Your patient attention to what I have said deserves its

reward in the termination of these remarks. I observe, in the last place, that science promises to agriculture benefits in the development of the noblest crop which any soil produces,—the manhood upon which the State builds its best, and on which, in our own land, the intelligent preservation of our liberties depends.

You do not care, I presume, to listen to any extravagant eulogies of the farmer's place in the social world. Your work is hard, your gains slow, in comparison with other occupations, whose charms, often delusive, keep the tide from country to city ever on the flow. Some of you have felt a vague discontent with fortune, which has bound you to the homestead acres. Ah, well! there are many more, and successful ones too, as the world goes, who envy you the narrow compass of your cares; the cooler and serener air in which you toil. But aside from feeling, it is a solid fact, the State has learned to expect much of you. For common-sense to balance mad theorists; for economy to rebuke luxury and extravagance; for the wise conservatism of property in land, as the needed counterpoise to reckless revolutionaries, you are held responsible. The simple institutions which lie at the foundations of the fathers' government survive best among you. More earnestly, perhaps, than any other class, you discuss and settle for yourselves, with no lack of independence, the great questions of the day. More than the vagrant dwellers in cities, you urged to its decision the national verdict against social wrong, and when the call came, you filled the army's ranks. Strong, liberty-loving men it is your duty, as your tendency, to be. It is not likely that the youngest child of to-day will ever see the time when the Republic will not totter to its fall, if you are less than this.

It seems equally certain that the education of the coming age will be largely scientific. This influence will reach the agricultural world in many ways. Through the common school, through the modification of farm implements and methods, through the public press. It will act, with its unsettling power, here good, here evil, on forms and institutions. The intelligence which it will develop may not always be a blessing; it may even strike savagely at the very restraints which are needed to make it a blessing. Our

hope must lie in a great part with you,—with the agricultural communities which invest the great centres of industry with the verdure of fertile soil and the homes of cheerful labor. Science will aid you who come nearest to nature to come nearer still. A wholesome pride in your profession, a more thorough knowledge of the laws among which it works, continually increasing skill to alleviate its hardships and increase its comforts, all this you may expect it to give. In short, it will give more power of being independent, happy, wise. You will not be the dwindling estate of the realm, whose golden age is over, but treasury, bench, executive, will more and more respect and honor you. It is only necessary that you cherish that self-respect which is ever ready to incorporate with the elements of daily life all that increasing knowledge shall suggest to make it better.

PRACTICAL HINTS ON FARMING.

From an Address before the Deerfield Valley Agricultural Society.

BY RICHARD LATHERS.

Agriculture embraces a knowledge of all conditions of vegetable life; the origin and growth of plants, and the source from whence they derive their nourishment; the constituent elements of the soil, and the chemical changes necessary to fertility. From this knowledge fixed rules are derived for the practice of the art. Careful and exact observation of the science, and the industrious application of the art, constitute the highest type of farming, and will insure the greatest amount of success. Many instances can be adduced where active industry has produced satisfactory crops and profitable farming without special knowledge of science; but it will be found, with rare exceptions, that such success resulted from partial application of the teachings of science, and that greater success would have followed a more exact conformity.

The so-called "book farmer" fails by not conforming to the practice which scientific farming requires in bestowing the necessary labor and proper economy in the management of his farm. The successful farmer must not only plant and fertilize on scientific principles, but he must plough and hoe on practical principles. The neglect of either of these conditions, by either class of farmers, will end in partial or total failure. The successful mariner must not only be practically a good sailor, and capable of performing every duty in sailing his ship, but he must also be a skilful and scientific navigator for conducting her safely and speedily to her port of destination. Voyages have been and may be accomplished without

fulfilling these conditions, but prudent passengers prefer to base their safety on both.

The theory and the practice of art are necessary to each other, and must be united in all pursuits of human industry and enterprise.

Agriculture is not an exact science, like mathematics; its facts and theories, although derived from observation, are subject to so many exceptions and contingencies, by reason of the variety of soil, changeable nature of climate and weather, and the failure of chemical action itself under so many conditions, as to defy absolute demonstration in any case, while the still more uncertain effect of electricity—that mysterious and all-prevading element which enters into every combination of soil or vegetable product, modifying, and at times suspending chemical action, and eluding the most searching investigations of the chemist—renders our best researches in agricultural chemistry uncertain. Still the most successful results are to be had by following the light it affords, and it will be found that success or failure in the long run will be in the ratio of conformity or disregard of its principles and theories.

Law and medicine do not insure absolute justice and health by the practice of their theories in the community, but without them our property and our lives would be subject to quacks and pettifoggers, in whose estimation practice alone is valuable. Agriculture is the great producer of our country. Even the products of our enterprising and thrifty manufactures depend mainly for their apparent importance on the value of wool, cotton and other raw agricultural productions which enter into and constitute so large a portion of the value of their products.

Not less than two thousand four hundred millions of dollars is our annual contribution to the national wealth, constituting the main support of its commerce and manufactures; and yet we cultivate but one-twelfth of our national territory, now embracing about three million square miles. The contemplation of the future power and influence of agriculture, when our whole territory shall be utilized and its whole productive energy directed to the development of our national industry and enterprise, ought to impress us with becoming zeal for

participating in the great march which agricultural development promises to the rising generation.

Already we have engaged in this occupation eight millions of horses, one million of mules, and nearly twenty millions of horned cattle; and including the value of farm implements and machinery, we have a money investment of not less than one thousand millions of dollars as a working capital, outside of the value of the lands and the buildings devoted to farming, which involve so large an aggregate of capital as to call for the utmost activity and enterprise of our people to produce an adequate income on an investment of so much consequence.

It is, however, to be deplored that by reason of our extended territory and sparse labor, and a want of a proper ambition on the part of our young men for agricultural occupations, that we fall far behind the productive energy of other forms of industry in our country, and still farther behind the agriculture of Europe. Our cities are growing prematurely at the expense of the rural districts, because our young men have become restless on farms, and seek that excitement in overcrowded trades and professions, and the more hazardous business of speculation, which at this time is so fearfully developing general bankruptcy and poverty in the cities and towns of our country.

New England has more particularly suffered in this way, as well as by emigration to the West, and it seems hard that the enterprise and intelligence of her sons should be utilized everywhere else at the expense of their old homesteads. The fact cannot be disguised that we have so undervalued the occupation of the farmer, regarding him as a mere laborer in a field devoid of progress, and requiring no intellectual effort to insure success, that an intelligent young man, with aspirations above such an occupation, finding little field for his ambition, quits the occupation as soon as he finds opportunity.

In 1850, the census shows that the manufacturers of Massachusetts produced annually but $158,000,000, while the census of 1870 shows a product of $554,000,000, an increase of over three hundred per cent. in twenty years. This evidence of enterprise and thrift is not only worthy of the genius and industry of our people, but it furnishes an important accession to our home market, by the increased demand for farm

products from the increase of the manufacturing population, and should have encouraged a corresponding increase in farm products to supply the demand. But we find that while by the census of 1850, Massachusetts had under cultivation 2,130,000 acres of land, that of 1870 shows but 1,736,000 acres, and while the production in 1850 of wheat, rye, corn and buckwheat aggregated 4,000,000 bushels, the census of 1870 shows a product of but a quarter of a million of bushels. The product of butter and cheese, in 1850, amounted to fifteen millions of pounds, and in 1870 it fell off to less than seven millions of pounds; and the census also shows a corresponding decadence in acreage cultivated, in persons engaged in farming, and in the depreciation of the value of the land.

This falling off is only apparent, and so far from being an evidence of the decline of our agricultural industries, is only a striking evidence of the notoriously defective census. The area of Massachusetts is 4,992,000 acres, while the number of acres covered by or embraced in the census of 1870, including woodland, and all improved and unimproved land of every kind, is only 2,730,283, or a little more than half the actual acreage of the State. More than nine thousand farms are left out of the returns entirely, and with them all the statistics that they involve, so that the census of 1870 does not give us even an approximation to the truth as to the present condition of our farm industry, as compared with that of 1850 or 1860. For this we must look to the statistics of industry, as returned to the State in 1875, and now nearly ready for use.

I am constrained to adduce the discouraging figures, because if they were true, the remedy is in our own power, and I have confidence in our young farmers—a race of the best type of American manhood and culture, having qualities the most versatile, strength joined with dexterity, and a facility to acquire practical and intellectual knowledge which fits them for any occupation which we can induce them to undertake. We must inspire them with confidence in agriculture as a progressive occupation, requiring the closest investigation of science and the best application of art, and, with proper industry and economy, as sure a road to independence as any other occupation so free from hazard and misfortune.

We must, by precept and example, teach them to ignore prejudice, however sanctified by habit, and to avail themselves of every improvement which this progressive age invents or discovers.

How destructive to manufacturing progress would be that spirit which ignores the inventions and discoveries of the day, and how fatal to the manufacturer who should persist in using old and exploded machinery and reject new processes and textures in cotton and woollen fabrics.

To compete, the manufacturer must not only be in the market with new fabrics in style and material to suit the necessities and even the whims of his customers, but he must be on the alert to avail himself of every improvement which science and invention discover or invent to cheapen or facilitate production; and the failure of nine-tenths of these does not discourage him from trying the next which offers. Formerly, large herds of cattle were essential appendages to a manufactory for producing the necessary amount of cow-dung to be used for the bleaching and dyeing processes of cotton cloth. The fortunate discovery of a chemical salt which performed the same functions cheaper and in a more cleanly manner, enables the manufacturer to dispense with the cows. The non-progressive spirit of agriculture would have used the cow-dung to this day, on the same principle as it ignores the application of cheap and condensed fertilizers, and persists in carting out forty loads of crude manure from the barn-yard, which modern agricultural chemistry shows to be equivalent to but one load of fertilizing material. Chemists all agree that in a ton of barn-yard manure all but ninety pounds is water, so that we cart out and handle nineteen hundred and ten pounds of water to get ninety pounds of fertilizer, as a tribute to the practice of our agricultural ancestors, a reverence for antiquity not shared by our manufacturers.

The great want of our agricultural interests is schools for practical education, directed to the special cultivation of farmers. The schools of design elevated the manufactures of England, and have measurably made them rivals in taste and cheapness of their French competitors in the markets of the world, and our own progressive manufacturers have

profited by the example. Our public schools practically ignore agriculture, even in the rural districts; and while our colleges are creditable to our national reputation for literary acquirements and professional scholarship, we need a system of popular instruction devoted to the farming interest. We need institutions, not to cram our young men with the dead languages and the revolting mysteries of heathen mythology, nor to make fine writers or eloquent declaimers, but devoted to teaching only such knowledge as shall be of scientific and practical value on the farm. Instead of Homer, Aristophanes, Horace and Terrence, let our young farmer be made familiar with Newton, Lyell, Playfair, Liebig, Silliman and Agassiz. Instead of being learned in the intrigues of the goddesses and the wars of the gods of ancient times, let them acquire mathematics, chemistry, geology, mineralogy, grafting, budding, fertilizing, and the history and practice of everything connected with the pursuit which affords occupation to so large a part of our working-classes, and on whom rests the responsibility and dignity of producing the basis of our national subsistence, wealth and power.

Mr. Fleischman, who was commissioned by the United States, in 1845, to visit Europe to obtain agricultural information, informs us in his instructive report, that some three hundred and fifty schools exist in Hungary and other parts of Europe, where boys from twelve to fourteen years are taught practical knowledge of the whole business of farming, and also so much mechanism as to be able to make or mend every machine or implement used in farming. The teachings tend to make them thorough economists, so that the farm shall always continue to improve. They are not taught abstract science, but positive knowledge,—soils, manures, rotation of crops, the kind of work, number of men, horses and cattle required to cultivate a given number of acres. Mr. Fleischman remarks that the perfection of European farming is due to these institutions.

We are fortunate in this State in having the nucleus of this much-needed education. The Agricultural College bids fair to meet every requirement expected from the able administration which now directs its affairs. But we want such institutions in every county of the State, and more

attention in our public schools to such primary education as shall fit our boys to enter and graduate there; and while on this subject, permit me to recommend the perusal by every farmer of the able and interesting reports of Mr. Flint, the Secretary of the Massachusetts Board of Agriculture. These reports are collated, with singular judgment and wise discrimination, from various practical and professional sources, and embody a perfect repertory of agricultural information, the result, in many cases, of direct experiment in soils.

The wonderful proficiency of the Greek mathematicians over modern professors has been accounted for by the fact that the Greek masters instructed their pupils by rule and compass, and demonstrated their problems on *real magnitudes* which they could feel and see, while problems of our modern teachers are less obvious to the scholar, because solved by algebraical process only.

The importance of agricultural training will be seen at once by comparing the disparity of our productions with those of France or England. France, with but one-fifteenth of our territory, and not as large as three of our medium States, produces fifty per cent. more wheat than we do on our fresh and fertile lands, and after subsisting a population not much less than our own, exports from the product of its soil double the quantity we do; and the English farmer manages, by superior productive economy, to extract profitable returns from lands burdened with an amount of annual rental and taxes which equal the value of the same acreage here in fee simple.

Much of our unproductive farming arises, I think, from a lack of capital. Too large a portion of the farmer's means is in the land. If a manufacturer should have three mills, with working capital only sufficient for one, it would be but a question of time when his embarrassments would ruin him. In England, where taxes and the rent of land compel the most rigid economy as well as the utmost skill and industry to make it pay, the farmer must have a sum of ready money quite equal to the cost of the same number of acres here with which to stock, fertilize and cultivate it. I am confident that if many of our farmers would dispose of half their acreage to procure ready money to cultivate the other half to the full extent of its productive power, availing themselves

of the use of modern appliances and fertilizers, that the profit on the half would far exceed their former operations on the whole.

It is the surplus production of each acre over the cost of producing any crop which constitutes the real profit of farming. If lands are highly cultivated and richly fertilized, they will produce double the usual crops, compared with ordinary farming, and yet at very little additional cost of labor. An improved reaping or mowing machine, while cutting twice the quantity of grass or grain, uses but the one pair of horses and the one man, and invests but the price of one machine. Market-gardening exemplifies the profit and value of limited acreage and liberal cultivation, and many of our progressive farmers have followed the example near cities and large towns, where lands are high and must be made productive or abandoned altogether. In such cases it has been found profitable and convenient to soil cattle by keeping them up in spacious barn-yards and feeding them on cut grass and other green crops instead of pasturage. I have tried this plan myself with great satisfaction, in Westchester, and would continue the practice on my Berkshire farm, but I have rough hillside lands, only fit for pasture.

This practice saves land,—as one acre soiled will produce as much as three pastured,—saves fencing, economizes food, keeps the cattle with more convenience and in better condition, produces more milk, increases the quantity and quality of the manure, and if universally practised here, as I have seen it in Belgium, where there are no fences to the farms, we should be greatly relieved of the wasteful and expensive necessity of fencing our lands. We are informed that the annual cost of fencing in the State of New York is not less than eight millions of dollars, and that the aggregate investment in fences will not fall short of one hundred millions. It requires an annual average expenditure of seventy-five to one hundred per cent. to make and maintain the necessary line and division fences of a farm of one hundred acres in our State. I have long doubted the policy of keeping large herds of cattle on our northern farms during our cold and protracted winters, especially if we can profitably dispose of our hay-crops.

No cow consumes less than two and one-half tons of hay or its equivalent in other forage, during the winter, and certainly the produce of the manure will not equal in money value one-quarter of her consumption of food. To formulate it: say two and one-half tons of hay is worth at least $30, and the manure of the cow not exceeding $8, showing a loss of $22 for the winter; and it is doubtful whether the milk of ordinary farm stock will more than compensate the pasture of summer and the care and expense of the year. Of course cows must be kept the year round for the production of milk and butter for the use of the family, and thoroughbred, well-kept stock may form an exception; but it will be found that the barn-yard is too expensive a manufactory of fertilizers for profitable agriculture, although a judicious and economical farmer will not fail to utilize the barn-yard manure which is derived from the stock he does keep for use or pleasure. Yet, when purchased by our farmers at $15 per load in a neighboring town or village, it is an expensive mode of fertilizing land which the profits of the crop do not justify. I would have our farmers purchase inspected mercantile fertilizers of well tested purity from manufacturers of reputation, to supply the deficiency of their barn-yards, enabling them to cultivate every acre of their land which can be spared for the plough, and to enrich every meadow by a judicious top-dressing, where the stocking will justify the application. The farmer that produces the largest yield to the acre will reap the largest relative profit, as it costs but little more to harvest two tons of hay to the acre than to harvest one ton on the same field. Hence, the second ton is a gain of ten to twenty dollars to the acre, surely. A farmer can well afford to spend a few extra dollars for such a result, and keep his land well fertilized and productive.

A few short rules will compass nearly all that is valuable for the application of fertilizers in practical farming. Manure must be soluble, ready to be absorbed by the roots of plants. A ton of dry charcoal or phosphate of lime on an acre of land would be useless, unless submitted to chemical decomposition by artificial process or by the slower, natural process of the atmosphere. Porous, sandy soil will not be benefited by the application of a larger quantity of fertilizers than the

coming crop requires, unless the fertilizers be mixed with pulverized clay, prepared peat, charcoal, or some other medium which will retain the surplus for future crops.

Land must be thoroughly pulverized, and the fertilizers fully reduced for their greatest solubility, so that particles of the soil and of the fertilizer are brought in closest contact. The use of a land-roller materially aids the process. In short, there must be careful cultivation of the soil, and exact chemical manipulation of the fertilizer, because all plants derive their nutriment from solution of gases, and all manures are valuable in the ratio of their actual solubility or the nature of the soil to make them so. This is true of every kind of fertilizer, whether derived from your barn-yards or the mercantile substitutes which you can supplement them with.

Air, water and change of temperature disintegrate rocks and render their alkali soluble, by which, in time, our most fruitful soil is produced. The fruitful lands around Naples, constituted chiefly of lava, have produced corn for a thousand years without manures. This soil is fertilized by the air by means of some chemical affinity with the lava every third year, when it is allowed to lie fallow for the purpose. This lava does not contain a particle of vegetable matter, proving that vegetable mould or humus, so highly valued by old farmers, is not a fertilizer, but is merely the medium by which fertilizers are retained, and valuable only as the decayed vegetation composing it happened to be more or less impregnated with fertilizing ingredients. The utility of ploughing in green crops, therefore, must be subject to the same conditions, depending on the fertilizing nature and quantity of the crop ploughed under, and in my opinion, is as expensive a mode of fertilizing the land as keeping a cow in winter to manufacture eight dollars' worth of manures by feeding thirty dollars' worth of hay.

Air is perhaps the most active and efficient aid of the farmer, furnishing not only the larger part of the fertilizing ingredients of our soil, but is the prime means of utilizing the fertilizers which we apply to our lands. Its chemical action disintegrates the hardest rocks, producing new combinations of productive energy, as well for the farmer as for

the miner. Mr. Boyle informs us that exhausted ores of tin and iron, being exposed to the air, become again impregnated with their respective metals. The air is no distinct element, but a mass of heterogeneous things, very much etherialized. Therefore, a well-hoed crop derives the advantage of contact with this wonderful medium and rich storehouse of nature; and a top-dressing of plaster of Paris draws in the same manner a supply of ammonia more reliable than the promises of many of the patent fertilizers sold by travelling agents.

The old English practice of laying lands to fallow was intended to get the fertilizing effect of the atmosphere. But the present English practice of a rotation of crops is far more speedy and profitable, by which the fertilizing qualities of the soil may be distributed by cultivating, in rotation, crops which respectively absorb different ingredients. Indian corn and wheat draw largely on phosphates; turnips and beets on potash and soda; and after these crops there will still be enough of lime, etc., to produce a good crop of hay, and this result, too, from one application of manure. The land, by this process, also derives the further advantage of certain fertilizing qualities which each crop produces of itself by the chemical action of such portion of the crop as may be left in the land, or drawn from the atmosphere.

The educated and observing farmer can mark out the system of cropping and the application of such fertilizers as are best adapted to the combined nature of the soil and the requirements of his crops. Of course, a still better and more scientific way would be a careful analysis of the soil; but I confess there are practical difficulties in the way which I hope time and culture will remove.

Many years ago, a farmer in New Jersey failing to procure a crop of corn from a field which he had taken much pains to cultivate, had the soil analyzed by Prof. Mapes, who found it deficient in chlorine, soda, phosphoric acid, lime, potash and ammonia. He supplied the missing fertilizers; a compost of common salt restored the chlorine and soda, spent boneblack (a waste from the sugar-refinery) restored the phosphoric acid, Peruvian guano restored potash and ammonia, and a small portion of charcoal-dust and plaster to retain the volatile portions. These chemical fertilizers cost but one dollar and

a half per acre, which produced sixty bushels of shelled corn per acre that very year.

It is well known that the silicate of potash is a leading constituent of the hay-crop, and is derived chiefly from irrigation. This was practically demonstrated some years since by an incident, as related by Liebig. During a thunder-storm near Manheim, in Germany, a bolt of lightning struck a hay-stack and reduced it to melted ashes, which became a vitreous stone of the silicate of potash, many people supposing it was an aerolite which had fallen from the heavens; and it would have been very difficult for the farmer who suffered the loss of his hay to convince his unlettered neighbors that that stone embodied the principal chemical ingredient of a hay-stack.

No practical farmer will undervalue barn-yard manure. It has kept its place as a fertilizer from the earliest ages of agriculture, and embodying as it does such a variety of qualities, will always furnish a ready and potent means of enriching the soil. But the question of cost and supply, and for use in distant fields, the expense of drawing it out and applying it must be considered by the economical and enterprizing farmer in this age of competition. Nearly the entire cotton crop of our country, and a large portion of the agricultural products of Europe, are made without it, and the use of artificial manures has become almost vital to production, because they are cheap as compared with their fertilizing value, light, and easily transported to our fields and economically applied. They are peculiarly suitable for the use of small farmers who cannot afford to keep large stocks of animals to produce manure, or the labor of manipulating it after it is produced, as compared with advantages of applying the exact chemical ingredient which his crop requires. In view of this necessity, it becomes the duty of the legislature to protect the farmer against the frauds in the manufacture and sale of this commodity. Laws making the adulteration of fertilizers a crime punishable as counterfeiting, would do much to protect us by sending the culprits to the penitentiary. The forger who counterfeits a bank-note, merchant's draft, or raises a check to a larger amount than it was originally drawn for, commits precisely the

same fraud as the manufacturer who misrepresents the constituents of his fertilizer. I have recently heard of a counterfeit of this kind where 1,500 pounds of coal-dust and ashes were found in one ton of a substance sold for bone-dust.

Much discrimination is necessary in the use of fertilizers, even when honestly prepared. Many of them, like patent medicines, are represented as embodying all the qualities necessary for any crop, and applicable to any soil, when, indeed, many of them are useless because of incongruous chemical composition, or the prevalence of ingredients not needed, or oversupplied in the soil for the crops to be produced.

At Bingen on the Rhine, where the produce and development of the vine were highly increased by manuring them with shavings of horn, it became evident, after a few years, that the wood and leaves were decreasing rapidly, the special fertilizer having too much hastened the growth of the vines, and had exhausted the potash in the formation of the first supply of leaves and wood, so that none remained for future crops, because while horn-shavings highly fertilize the grape, they supply no potash to produce the vines. A dressing of cow-dung supplied the want, and the vine flourished as before. If the nitrogen had been exhausted instead of the potash, the cow-dung would not have succeeded. And if you find your old pastures exhausted and the flow of milk falling off, the application of a couple of barrels of bone-dust to the acre will restore fertility to the soil, because bone-dust furnishes the phosphate of lime which the pasture needs. More than half of the weight of bone-dust is pure phosphate of lime and magnesia. Sixteen pounds of bone-dust will supply enough of phosphate to produce a ton of the best hay. But it requires moisture to make it active in dry seasons, and therefore on a sandy soil, it oftens fails the first year.

Hair, horn and woollen rags are still more valuable as fertilizers, being nearly pure in the chemical qualities required by the soil, but they must be rendered soluble by artificial means for immediate use as a fertilizer. Blood and flesh, so highly valued by many farmers, contain ninety per cent. of water, and it requires ten tons of them to equal, in fertilizing power, one ton of hair, horn or woollen rags, when dissolved by time or artificial process. Bear in mind, no manure or

fertilizer can be active till absolutely dissolved, and hence so many apparent or real failures in the use of mineral fertilizers.

It is estimated that the supply of ten pounds to the acre of phosphate is imparted to the soil during the five summer months of average rainfall (about two thousand tons to the acre), which furnishes, perhaps, a sufficient supply for an annual crop of wheat, but would be insufficient for most other crops. Hence the general usefulness and utility of bone-dust, furnishing as it does so large a supply of phosphate and magnesia, so essential to all crops, and being less adulterated than most of the commercial manures.

The soil of the earth is shallow, as a general rule. The average depth does not exceed one foot over the entire globe. It is, therefore, just fitted for the convenience of the plough and the spade. Beyond this depth, without special cultivation, plants find no nourishment. Arable soil is the result of a process of chemical action which disintegrates rocks by the influence of water and atmospheric action. The earth thus formed, having nourished vegetables and animals, which in turn perish and decay, producing what we call soil, is more or less productive as it becomes charged with the gases of the atmosphere. The principal elements are silica or sand, alumina or clay and lime, making a composition of nearly ninety-five per cent. of the whole soil; magnesia, soda and oxide of iron with manganese, sulphur, phosphorus and chlorine making up the other five per cent. You will therefore perceive how small a portion of the soil is constituted of these chemical elements, and yet the land would be unproductive without the relative quantity of each of them. Nor will nature, as a general rule, permit the abundance or excess of one to supply the deficiency of another. Hence the importance to the practical farmer of a well-defined analysis of the soil, as well as the chemical qualities and quantities of the fertilizers to the proposed crop.

It cannot be expected, in the present low state of practical agriculture, that these investigations will be brought to bear to any great extent on our farms, but we must approximate to them as zealously as the nature of the case will admit. The ambitious archer will not hit the sun, but his arrow will reach a greater altitude by trying to do so.

THE FARMER, AND HIS RELATIONS TO THE STATE.

From an Address before the Berkshire Agricultural Society.

BY SANBORN TENNEY.

What wonderful achievements and improvements in every department of industry have the last hundred years witnessed! Time and memory would fail us if we were to undertake merely to mention them. It is enough for our present purpose merely to mention the steamboat, the railroad, the telegraph, the cotton-gin, the modern ploughs, the cultivators, the mowing-machine, and the reaper. These, and such as these, suggest the wonderful progress of the past; and they should inspire every one with the highest hopes for the future.

And now is a fit time for the farmer, and for the mechanic, to consider what are the next steps which they can take to most advance their own interests, the interests of the community and of the State.

Admitting, as we all do, the vast importance of the farmer's profession, it behooves us to see to it that we not only sow the best seed, and use the best fertilizers and the most improved ploughs and other agricultural appliances, but that we also keep the farmers' ranks *full*, and on the *increase*, of the best blood in the nation.

It will be a sad day for the community and for the State if the time ever comes when the best young men and women almost universally regard agriculture as an ignoble calling, or one which has few or no attractions for them.

We must see to it that we not only make agriculture a profitable pursuit, but we must invest it with such attractions that the best young men and women will not wish

to leave the country and the farm for the city and the yard-stick.

The farmer's home is indeed one of plenty. Comfortable houses, spacious barns, broad acres of meadow and field and woodland; good horses, cows and oxen, and sheep loaded with finest of wool; store-rooms filled with milk, and cream, and butter, and cheese, and newly-laid eggs; cellars stored with pork and beef, and all the products of the field, the orchard, and the garden,—are the almost constant surroundings of the farmer, and it would seem they leave little to be desired. And yet, the young men and young women of to-day find too little attraction, in the farmer's home and in the farmer's pursuits; and too many of them leave the quiet homestead, and cast their lot with the crowded populations of the cities—where some, indeed, succeed, but where many, after a long struggle, utterly fail.

Now, if there be anything that we can do to make the attractions of the farm and farm-life greater than they now are, and thus retain more of the best young men and women in the farmers' ranks, surely we are ready, I know, to consider candidly any suggestions which tend to secure this great result.

Since there is so much of plenty and of physical comfort in the farmer's home and in the farmer's life, it would seem that hardly more is needed to make that life desirable by the young than that the homes should be made still more beautiful and attractive, and that the idea of drudgery should be still more separated from the duties of the farmer's wife.

I am not unmindful that I am here stepping on delicate ground; but this shall not deter me from saying that it is my conviction that farmers will greatly advance their own interests, and greatly contribute to the welfare of the community and of the State, if they will give still more attention to adorning and beautifying their homes, and thus making them as attractive as possible to those whom they would win to the noble work in which they themselves are engaged.

A conveniently planned, and architecturally beautiful, and neatly painted farm-house,—no matter how humble, if it only serve its purpose,—and this, surrounded by a well-kept lawn, will do much to make the ambitious boy and girl contented

with the country and the farm. Especially if, with these, aid in the household be as freely furnished to the wife and mother as to the farmer himself on the meadows and in the fields.

And these things, which I now suggest as worthy of your attention, are not in the line of useless expenditure and extravagance, but are strictly in the line of that economy and thrift which pertain to the highest interests of the home and of the State.

If there be any home that should be attractive in its exterior appointments; if there be any lawn which is broad and green and smoothly mown and beautifully adorned with shrubs and flowers—that home and that lawn should be in the country and on the farm, where there is ample space and ample time to secure these things, even without withholding labor from the ploughing, the sowing, or the reaping. And I am sure that no investment of time and labor in the work of the farm would, in the end, yield a more satisfactory return than this investment which I have now suggested.

Another thing worthy of still more attention than it now receives, is the hay-crop. Farmers, as a general thing, mow too much ground, and as a whole they cut too little hay.

The hay-crop is the second great crop of our country, and might easily be the first. But its great importance is not even now fully appreciated, as the means for its increase are comparatively little used.

It appears that the hay-fields of Massachusetts to-day yield something less than a ton to the acre. Now, within five years, this yield should be fully doubled, thus greatly adding to the income of the farmers and the wealth of the State. And the farmer has the means at his own command to secure the great result. He needs but to drain his swamps and his bogs, and raise clover and timothy where he now grows alders and bull-rushes. He needs but save with strictest economy all the fertilizers from the house and from the barn; to bring to his yards at the close of each day all his cattle from the pastures and the fields; to keep the floors of his stalls well supplied with loam, and his yards with muck from the bog; and then to apply all to the lands with the greatest judgment and care.

Oh, when shall we learn the value of fertilizers to the farm and to the nation! There is no waste on the farm nor in the

country, to-day, greater than that of fertilizing materials—the very gold of the nation. These materials, for which our lands suffer, and for the want of which may at length wear out, are allowed to pass away in the winds, to flow off in the drains and in the sewers, and to be washed away by the streams. And thus there are lost in our country tens, nay hundreds, of millions of dollars every year! And on many a farm where farming does not seem to pay, the fertilizers which are wasted, would, if saved, more than pay for the clothing of the entire household. When we know and fully appreciate these facts, we shall realize how much there is for the farmer yet to do for the advancement of his own interests, and those of the State.

Farmers can greatly benefit themselves, and confer lasting benefits upon the State, by preserving and increasing the forests. This is a subject in which every person in our country should have the deepest interest. Farmers, mechanics, manufacturers, merchants, builders of railroads and warehouses, capitalists and statesmen—all classes and all communities in the State and in the nation—have their welfare linked with the forests; and as the forests are preserved or destroyed, so their dearest worldly interests will flourish or decay. What havoc has been made among the forests of this country! What useless havoc! And still the work of destruction goes on. Whole forests are felled; hills and mountain-sides are laid bare; and all apparently without one thought of the ruin that is sure to follow.

We are cutting our forests to-day faster than they grow; and if this process continues, not only will the fire on the hearth be a luxury which few or none can enjoy, and lumber and timber be difficult to obtain, but the streams from the mountain-sides will disappear; barrenness will take the place of fertility on our mountains and on our slopes; and the wheels along our streams will cease to turn, and the spindles and the shuttles will cease their motion—unless driven by some other power than water.

There is no doubt as to the results which are sure to follow the destruction of the forests of a country. The examples are too many and too sad, to make it necessary that they should be multiplied.

Italy, Switzerland, France and Spain, and other countries, furnish us with plenty of examples to show us the sad results which are sure to follow a too great destruction of the forests. Not only have vast areas in these countries been washed bare of their soil, and the slopes cut and gullied by the rushing torrents, thus rendering particular regions next to worthless, but the resources, and prosperity, and power of the whole State have also been most seriously reduced and crippled by the reduction of the forest areas below what the laws of nature allow.

A little more than a century ago France had, by estimate, about 42,000,000 acres of forests—an amount not greater than should have been permanently retained; but in 1860, so great had been the destruction, that the forest areas of France were reduced to 20,000,000 acres; thus greatly enfeebling the empire, and well causing anxious forebodings in regard to the century to come.

Russia is already beginning to suffer because she has not properly cared for her forests. Not only is wood beginning to be scarce and dear, but her great rivers, the Volga, and others, the great thoroughfares of commerce, are drying up on account of the removal of the forests from their sources.

Spain, once so flourishing and powerful, allowed her forests to be destroyed; and when she would rebuild her fleets and enlarge and perfect her navy, the price of timber was so high that the treasury had not sufficient means to purchase the needful supply; and so she lost her prestige upon the sea, and her power and dominion in the world.

I said that we are cutting our forests faster than they grow. And if measures be not taken to inform and interest and instruct the whole people, in regard to the relation which the forests sustain to our material interests; if there be no check to the destruction now going on in nearly all parts of our country where forests still remain, we, like the nations of the East, shall soon begin to reap the bitter fruits of our wastefulness, short-sightedness and neglect. Nay, in the scarcity and consequently high prices of wood, lumber and timber, we have already begun to reap.

Not less than a fifth or a quarter of every country or State should be occupied with forests. To-day, hardly a State in

the Union has more of forest area than it should permanently preserve; and most are sadly deficient in this respect. It is true that we have wonderful forests in Michigan, Wisconsin, Minnesota, in the Sierra Nevada, and in Washington and Oregon; but we have also hundreds of thousands of square miles in the great central portions of our vast domain, and other hundreds of thousands of square miles on the great Western plateau, between the Rocky Mountains proper and the Sierra Nevada and Cascade ranges, where there is scarcely a forest or a grove. And nowhere in our country west of the 100th meridian is there a forest of tough, hard wood, suitable for wheelwright and other similar purposes.

When we consider these facts, and when we see how rapidly the timber of Oregon and Washington is cut and shipped to South America, to the Sandwich Islands, to China, to France and to England; and when we see how rapidly the forests are felled in Minnesota, Wisconsin and Michigan, to supply the wants of the central and eastern portions of our country, we shall see that there is ample cause for anxiety in regard to the future of this nation.

In this connection, just consider for a moment the fact, that, as extensive as were the forests of California when the gold-seekers went there in 1849, one-third of the timber and lumber of that vast area has already been consumed. Yes, California has used about one-third of her forests in a quarter of a century! What will be her condition a century hence, as regards wood, timber and lumber, unless the wisest and best of counsels prevail? To ask the question is enough; we need not stay to answer it.

It is true that it is not fully established that forests increase the rainfall of a region or a country: but it is sure that they are the great conservators of the rain which does fall. They shade the ground, and thus prevent a too rapid evaporation. The spongy soil beneath the trees hold the rain that falls, and gives it up, little by little, and thus the springs are ever full, and they feed the clear mountain-streams which unite to fill the broad river.

Strip the hills of the forests, and the rains which fall there quickly form torrents, which rush down the water-courses, bearing the soil, and the sand, and the gravel, and the bowl-

ders, and everything before them, and swelling the rivers so that they, in turn, carry destruction along their course. Thus the water soon disappears from the hills, and these are soon dry and mostly barren, and the water-courses are soon only a dry and rocky bed, so to remain till there comes another rainfall.

In this great work of the preservation and increase of the forests, none have a greater opportunity, or a greater responsibility, than the farmer. If he would do what is best for his own interests, and best for the State, he would not allow another forest to be destroyed, where he has the power to preserve it.

Yes, we must all interest ourselves in this great matter of the preservation and increase of the forests. The time has come when no more forests should be destroyed, and when many that have been destroyed should be replaced.

In every forest, trees should be judiciously selected for cutting; and, as fast as one is removed, another should be planted in its place. And all the areas in our State, and in other States, not suited or needed for agricultural purposes or for grazing, should be planted with such trees as they are best adapted to nourish and mature.

There are vast areas in almost every State, which are of little or no value, except for forests. Massachusetts has, to-day, tens of thousands of acres of just such areas, every rod of which should be planted with trees during the next two years. And yet, while we have such a scarcity of woodland, we are not only not planting forests to any considerable extent, but we are cutting down whole forests, and laying bare our hillsides and our mountains, as though there would be no need of forests in the future.

And here let me say, gentlemen, that the destruction of forests now going on in Berkshire County will be sure to bring sad results in the not far distant future. Not only will our streams be dry the greater part of the year, but the soil will be washed from the mountains and the hillsides. And when these forests are gone, and the clear mountain streams are dry, Berkshire will not only have lost much of her material wealth, but she will have lost much of the magnificence and beauty which have made her so attractive and so renowned.

And, gentlemen, it may become desirable, nay, necessary, for the public welfare that the preservation and increase of the forests of this country be made a subject of national legislation, as it is in France to-day.

Farmers can greatly advance their own interests, and the interests of the State, by becoming still better acquainted with the real nature of our government, and the means by which it may be maintained in strength and in purity.

Farmers, you hold the balance of power in this country to-day, and you will ever hold it. What responsibilities, therefore, rest upon you! According as you vote, so, mainly, will our government be weak or strong, corrupt or pure.

Inform yourselves perfectly in regard to the nature of our government, and to all that pertains to its highest interests; train yourselves to independent thought and intelligent action, cutting loose from party leaders whenever the interests of the State require it; and educate your sons and your daughters in the same spirit, and our government will be maintained in theory and in purity.

And finally, if the farmer would secure the highest benefits which it is possible for man to attain, he must labor to become all that it is possible for him to become, not only physically, but also intellectually and spiritually. He must cultivate, not the land only, but he must also cultivate his social nature, his mind, and his heart.

THE AGRICULTURAL OUTLOOK.

From an Address before the Hoosac Valley Agricultural Society.

BY GEORGE B. LORING.

While agriculture stands at the head of all our industries, and is the occupation of the large mass of our people, its laws are still vague, and even its position requires constant and active defenders. Man has mapped out the heavens and sounded the seas and explored the mineral wealth of the earth, and understands all knowledge, but he is still groping for definite agricultural rules—the fixed laws by which he can cultivate the earth and increase his flocks and herds. Man, moreover, has a natural love of land and of the harvest which goes with it. It is not easy to tempt people away from a fertile soil into manufactures or commerce. He who counts his cattle by thousands and surveys a broad landscape of his own acres, will not voluntarily leave all this and confine himself to a mill or a machine-shop. The associations of the farm, too, are so attractive that man naturally tends thither as to his home. And yet no occupation requires such defence and eulogy as this. The work of the orator and writer are in constant demand in its behalf. The ingenuity of the press is taxed in its support. The most energetic societies are established for its benefit. And all this appears to be necessary, in order to develop all its capacity and to prevent a fatal neglect of its interests. All men praise farming, but not all like its toil. All Americans believe in the ownership of land, but all do not believe in cultivating it as a means of subsistence. And next to establishing the laws of the occupation in this country, comes in the problem how to make agriculture so uniformly profitable and so systematically easy as to attract

the owner of land to devote himself to the business. The independent ownership of the soil here stands in the way of farming, inasmuch as the natural desire of a land-owner is to employ others to do that which he might and ought to do himself.

Still, farming is now, as it was in the early days of the Republic, a leading industry; and whether agreeable or not, it will always be the support of by far the largest part of the human race. That it may be the leading occupation of a prosperous and powerful people, there is no doubt. When our country was settled, when it was endowed with nationality, agriculture was almost the only occupation known among us. It was an agricultural people who founded every colony; it was "the embattled farmers" who fought the battles of the Revolution; and it was from the resources of a people thus occupied that the financial honor of the country in that early critical period was maintained. Farming then was comparatively easy. Our ancestors lived on a virgin soil, and they raised great crops with but little difficulty and without any great expense of fertilizers. The pastures were luxuriant, and cattle of any proportions and structure were easily fed on them. Col. Pickering gives a record of crops in Essex County in his day which astonishes us now,—700 bushels of potatoes, 800 bushels of Swedes, 1,000 bushels of mangel-wurzels to an acre, and thirty tons of hay on ten acres year after year, and all this without great difficulty or expense. The farmer of those days found it easy to supply his family, and always had a surplus for the neighboring market, and found something to add to the exports of the country. Farming was easy, profitable and substantial. It lay at the foundation of the State and of society.

Nor has this relation changed in our day. From the products of the soil we still derive the largest amount of that export which must, in a measure, secure our financial success. It is a good thing for a people to have the balance of trade with foreign nations in their favor. The payment of foreign indebtedness by the products of a nation's industry, means national prosperity. And I am always confident of the financial success of a people when their exports exceed their imports. It was so in the early days of our Republic; it is so

now. If we look at the returns of our exports during ten months ending April 30, 1875, we shall find that our exports largely exceeded our imports. And if we examine that record carefully, we shall also find that of all our exports, a very large proportion was the product of the soil. Not in cotton or woollen goods, or in machinery, or in any of the products of the labor of the artisan and the mechanic, did our exports abound. Of the $565,000,000 exported, we find $167,000,000 in cotton, $10,000,000 in wheat, $15,000,000 in flour, $7,500,000 in cheese, $10,000,000 in beef, a vast sum also in pork, lard, hams, corn, tobacco, and all the various products of agriculture. So that out of $565,000,000, nearly $400,000,000 were raised on the land, or worked up by the agricultural population. This fact should never be lost sight of. And we cannot too deeply congratulate ourselves that our farms are still enabled to add so much to our national wealth, and constitute so large a portion of our national industry.

The connection of agriculture and the ownership of land with our social and civil system, also forms an interesting part of its history. The division of landed estates among a people indicates more than almost anything else the character of its institutions. The first thought of a powerful conqueror, or an aspiring monarch, or a ruling aristocracy, has always been to get possession of the land. The title of great landed estates in England springs from the crown, and all the laws of England relating to land favor not only a feudal tenure, but also the retaining of land in large masses by one individual. This was the law of all Europe previous to the code Napoleon, which divided France into small estates. When the tenure of land was fixed in this country, such a system was set aside, and the division of the land into small farms by the Plymouth colony became, at last, the universal law here,—a custom which, since the war, has been fixed even in those States which previously were occupied by landed proprietors on the one hand and a servile class on the other. When De Tocqueville visited this country, he pronounced this to be the fundamental genius of our institutions, and he thought he discovered in our people and their love of land, and in our civil system and this easy division of land, the secret of our national power. He considered, it is true, the civil rights which go

with it, the opportunity which every man enjoys in taking part in the working of the State, and the chances held out for civil distinction in large and small degree to all who enjoy the confidence and respect of the community, as also conducive to popular virtue and intelligence. But it was the land which really lay at the foundation.

The importance of this easy tenure of land is recognized even in countries where it does not prevail. John Bright promised this to the people of Ireland after the disestablishment of the church there, knowing as he did that this alone was needed to make the Irish nation prosperous and happy. But Mr. Bright's promises were not fulfilled. Such a privilege was found to be impossible, in the face of the landlords of England; and so strong was the prejudice against it, that an attempt to introduce it did more to break down Mr. Gladstone's administration than any other act of all his liberal policy. Even Lord Derby eulogized the system; and not long since, in an agricultural address, boasted that the existence of 30,000 landholders in Great Britain was sufficient to show that even there the principle of a liberal division and subdivision of land was required. But Lord Derby forgot what landholding under what is called the American system is. Of the 35,000,000 of people in the United Kingdom, he found, according to the census, 30,000 persons possessed of landed estates, and he thought the division a liberal one.

But had Lord Derby examined the condition of Massachusetts, he would have found that in our 1,500,000 of people, we have nearly 50,000 recognized farmers, and that of our entire population probably more than 300,000 are owners of large or small parcels of real estate. The ease with which land is acquired here, and the substantial character of its possession, has always made it especially desirable. Our early merchants all bought farms, when their fortunes would allow it. Merchants in olden times, as now, looked upon the land as most desirable property. The members of all the learned professions desired land and received it. The colonial clergy were settled for life on small salaries and the donation of a farm. Lawyers rapidly became landholders. Physicians, as they advanced in their professions, made rapid accumulations

of property of this description. And the ownership of land became universal.

That this system is everywhere conducive to good agriculture, does not naturally and necessarily follow. The division of a farm among a multitude of heirs breaks up the cultivation of that farm at least. The dispersion of property of this description necessarily weakens its capacity to support its occupants, and prevents the long-continued application of an expensive and elaborate system of cultivation. It tends, moreover, to encourage that abandonment of the land which has at last become characteristic of our people. And the great problem now is how we shall attach to this system of landed division and subdivision a mode of farming attractive and profitable.

That this can be done there is no doubt. The farming which is remunerative in the older States, and will, ere-long, be remunerative also in the new ones, is that farming which can be applied by the individual owner to a small tract of land in the neighborhood of a good market. This is profitable everywhere, even in England, where, by the side of the wholesale agriculture of the great estates, special farming is carried on to such a profit that a rent of $500 a year per acre is paid for the land, and a profit of $300 per acre is reaped from its cultivation. So it is in our own country. The prosperous farmers are those who cluster around our great cities and supply their markets. And while the remote regions are being somewhat deserted, the popular centres are becoming the seat of an active, prosperous farming. That our people will return to the land, and adopt this system, is most desirable. With it go not only the uniform prosperity and undisturbed thrift of agriculture, but also the habits of systematic industry and active mental energy which attend other branches of business. When we transfer the original industry of our mills to our farms, our agricultural prosperity is secure.

TEXAS CATTLE-DISEASE.

From an Address before the Housatonic Agricultural Society.

BY NOAH CRESSY.

This affection was comparatively unknown to pathologists until within the last ten years; and though mysterious in many respects, yet it may be defined as a specific fever that is very malignant in this section of the country, and one which is propagated by contagious effluvia. The alvine discharges are the probable source of infection. This disease usually occurs but once in an individual, and only in bovine animals. It is attended with congestion of the liver, spleen, kidneys, and portions of the bowels. The urine is somewhat scanty and high colored in proportion to the severity of the attack. In fatal cases, the bladder is usually found distended with dark sanguineous fluid when not previously ruptured from the accumulation of bloody water.

The native haunts of this malady are the tide-waters of the Gulf. It never occurs spontaneously in a region of frost, and when carried beyond this limit, in summer, soon dies out on the return of cold weather. In the Northern States it is not contagious from one native or acclimated creature to another, and can only be induced by exposure to Southern cattle that have not been wintered in our rigorous clime or beyond the line of snow. Hence there is little or no fear of the disease being communicated to our stock by the native cattle from Ohio, Illinois or Kansas, even while sick and dying in the same inclosure. The contagion comes from another source, and that direct from the *plains*. This through traffic is the source of all the mischief, and the government should interfere for home protection. The annual

loss in Western beef-stock is now immense, and it will continue to remain so until the whole matter is under active veterinary inspection.

The period of incubation in which the disease is awakened into activity has not been accurately determined by experimental cases, but according to our observations last year, from ten to forty days may elapse from the time of exposure, before the creature shows signs of being affected. There is, evidently, a great difference in the susceptibility of our Northern cattle. Some may escape it altogether, while others may fall victims to it in a very short time. The temperature and the time of the year have much to do with its early manifestations. The infection is the most virulent during the warm, sultry weather, and in a cold, wet season it is very inactive. Hence the appearance of this malady, after a given exposure, is very uncertain. In the early part of summer, most of the exposures are affective, with the disease soon following, and that with very fatal consequences. But later in the season the invasion is less marked, very irregular in occurrence, and the mortality much reduced. But usually, from general exposure where native cattle have been turned into a lot in which Texans have been recently pastured, it will require from four to six weeks to develop the malady. In this respect Secretary Gold and I observed some curious facts last fall, in Connecticut, which need to be explained. Either natives may give this disease, contrary to universal testimony, or the period of incubation must be extended to three months in certain individual cases that occurred under our inspection. The early symptoms are often quite obscure, and the manner in which the disease appears is quite variable, owing to the age and general condition of the animal. In cows you will notice, perhaps, a sudden diminution in the quantity of milk as the first indication of the approaching trouble. The ears droop, the gait is sluggish and tottering, and more or less trembling will be seen about the flanks. There is a disinclination to move, and the creature stands for some time with depressed head in one position. The back is arched, the abdominal walls are shrunken, and the patient looks poor and hollow. The skin is dry and hot, especially about the head, and is seldom or never moistened by per-

spiration. The bowels are usually very costive at the commencement, but in a few cases I have noticed a looseness in the last stages. The fæces are frequently retained for several days, and thus discharged with difficulty, being very hard and dry, clothed in mucous with stains of blood. The urine becomes an important symptom to observe. At first it is scanty and high colored, and there are frequent attempts to pass it; but later the bladder becomes distended, its walls paralyzed, and the power of micturition lost. After death the kidneys appear swollen from the effusion and transudation of the blood within the tissues. They are much enlarged at times, and somewhat distorted in form, as though they were twisted. On section they appear very dark and unnatural within. The urine is bloody, and when the disease is viewed from this pathological point, it might well be called the "Red Water" of Europe, which it so much resembles. The bladder, after death, is usually distended with dark, wine-colored liquid, and, with its contents, will frequently weigh twelve pounds. Such a condition is but the consequence of the congested state of the capillaries in these eliminating organs. The respiration is but little affected, and the heart and lungs show no signs of disease, unless complicated. Hence the great difference in symptoms between this and pleuro-pneumonia.

In some obscure cases there is oftentimes great doubt entertained during life as to the nature of the malady, but the appearance of the morbid anatomy of the internal organs upon post-mortem examination is so marked that we are enabled to decide the matter at once. The spleen is found invariably much enlarged. In this respect it closely resembles splenic apoplexy. It is often increased to five times its normal weight, and sometimes even more. This organ is completely engorged with blood that is undergoing chemical changes towards putrefaction. The tissues become soft, and the viscus is not unfrequently ruptured, even before death. I saw a case a few weeks ago, at Brattleborough, Vt., where the spleen was thirty inches in length, eight in breadth, and three inches thick, and weighed twelve pounds. Such an organ cannot be easily overlooked. In Chicago, a few years ago, this condition was regarded as a sure indication of the disease,

and hence all such meat condemned, as it truly should be in every case of this kind. The liver is also much congested and enlarged, often twice its normal size, weighing from twenty to thirty pounds. There is more or less softening, and it is sometimes waxy. It is very yellow in color, and occasionally a tinge of greenish black. The gall-bladder is usually full of dark, viscid and flocculent bile. It contains an abundance of granular flakes, which present a brilliant appearance of transmuted light, and are characteristic of the disease in question.

There is more or less inflammation and erosion about the stomach, especially in the fourth apartment, known as the abomasum. This, with the upper portion of the bowel, is often congested and softened. The effects of this congestion appear in a marked degree in all the Texan and Cherokee cattle when slaughtered for beef in our Northern markets. Hence it might be inferred that the meat was diseased also. Yet we have no proof that any harm ever came from eating it. But when we remember that the spleens of all the Southern cattle are larger than those in our native stock, we should well consider this whole matter in a sanitary point of view, before adopting this class of cheap beef from such malarial districts for our daily use. I would not condemn such meat as unfit for food, yet I much prefer to have a home-made article. The blood in this disease undergoes very important changes, and there is even abundant evidence of the dissolution of its proximate elements. The red corpuscles are perceptibly modified in form and size, as well as wonderfully diminished in quantity in the last stages of the malady. Hence the coloring matter is diffused all over the body, and appears in the excretion from the kidneys. This constitutes the Hæmaturia, "Red or Black Water," as the case may be, according to the length of time the urine has been retained in the bladder. Bile is always to be detected in the blood, and thus acts as the solvent to these anatomical elements. Cholæmia, therefore, exists, as is shown by the yellowish coloring matter found in all the exudations that have taken place. This is well shown beneath the skin, and in nearly all the internal organs.

To diagnose this disease, the thermometer is universally acknowledged to be the most valuable instrument that we

possess. It enables us to determine the exact degree of internal heat, which is an important symptom at an early stage of the malady. The elevation of temperature indicates the severity of an attack, and this will vary from 100°, the normal standard, to 108° in fatal cases. And the ticks, which are zoölogically known as the *Ixodes bovis*, are also important in doubtful cases. Their presence seems as a label to tell us either from whence the creatures came or the exposure they have encountered. Hence, when we find a sick animal that shows a high fever-heat, and is infected with ticks, we can be almost sure, even though in the incipient stage, that it is the Texan plague. And this will soon be corroborated by the appearance of bloody water and other characteristic symptoms.

As this affection is so very fatal in the majority of cases, it would seem that little could be done in the way of treatment to save an animal in the active stage of the disease. Various plans of medication have been resorted to, but thus far with questionable results. No *specific* medicines, however ardently claimed or faithfully administered, have yet been found to stay its ravages in every case, and as this is a constitutional malady, eliminatives and antiseptics would naturally seem to be called for, and such medicines, like carbolic acid and its various salts, have been used in all stages, and it is worthy of further experimentation. Common salt is believed to exert a favorable effect, when given freely to all cattle that have been exposed in the line of transportation, especially when they have been deprived of drink for several days, as is often the case in the shipment of Western stock to our market. In the majority of cases cathartics are specially indicated, and when given early have operated favorably, and here it should be remembered that salts are the most appropriate physic for cattle in this and other febrile affections, and should be given in large doses of a pound or more. No use to give a saline cathartic to cattle sparingly; you will always be disappointed with the results, even though a valuable agent in this respect. As soon, therefore, as you observe an animal to be affected, you should open the bowels at once by the free use of epsom salts, and continue this until all costiveness is overcome.

The diuretics are a very important class of remedies to be used, and should be given early. Saltpetre, acetate of potash,

and sweet spirits of nitre are among the best, and an ounce of each of them at a dose, several times per day, will soon produce the desired effect. Half an ounce of turpentine for a few times works admirably at a critical stage when the bladder has become distended with high-colored urine. In such cases I have used gin and a strong tincture of the oil of juniper, and have seen much relief afforded to a creature in a dying state. Hence I would advise the free use of such remedies to evacuate the bladder, and thus aid in the work of elimination. Bleeding has been strongly advocated, but it must be resorted to early, to get any perceptible effects. When the spleen has become congested, there is little chance of affording amelioration by venesection. But at the commencement of an attack, if the animal is strong and fleshy, it is well to bleed, and no doubt many cases have been saved by so doing, yet I have no faith in the universal practice of the abstraction of this vital fluid.

Thus, from no meagre experience in the treatment of this disease in Connecticut and at Brattleborough, Vt., as well as more recently in our own State, I am fully persuaded that a large proportion of these cases may be saved under the watchful eye of a skilful practitioner. But the veterinarian must be called at an early moment, and give his undivided attention to an outbreak of this kind, for there is no time to be lost after the *first* appearance of the disease in any case.

RISE OF AGRICULTURE.

From an Address before the Norfolk Agricultural Society.

BY THEODORE LYMAN.

In the very nature of things, it seems as if digging the earth ought to bring something good to pass. The Greeks, who seldom went wrong in a name, called earth mother; the mother from whom all come and to whom all return; the mother who teaches her children this lesson, that food follows work, and without work there is no food; the mother who tames her wild offspring by long and steady discipline of toil. For man is by nature a destroyer and a waster. The savage kills fish and game, and snatches wild berries and roots, thoughtless of their decrease. In the ancient shell-heaps of Denmark, or in the river gravels of France, we find the mute record of such savages who once peopled the larger part of Central Europe. It is a dreary record—everything for waste, and nothing for renewal. The flint hatchets, knives and arrow-heads, the piles of shells, the bones of deer and wild oxen, split to get out the marrow,—all denote a race that took what they could from nature, and returned her nothing. They had no ear for the lessons of Mother Earth. There are some children nowadays who will not mind their mothers, and who get sent to the State Reform School. The reform of those old oyster-eaters and bone-splitters was very gradual. Archæologists tell us that they first became pastoral in their habits, and took to keeping horses. Now I am not going to assert, in the presence of our honored president, that horse-raising is a semi-barbaric practice; but the archæological succession does go to prove that wheat-growing is a step beyond it. Nor do I maintain that the men of the ancient

stone period raised horses artistically, as they are to-day raised at the Home Farm. On the contrary, the numerous skeletons found on the sites of those long-forgotten villages, show us that the prehistoric horse had too big a head. I might say he was all head; and, as a Hungarian officer once remarked, "A horse does not trot with his head." In our day we have improved. We try to have the driver all head, and the horse all legs. Again, our horse-breeders are advanced in respect that they use trotting-wagons, albeit we must not boast of them too much; for, in the museum at Florence, you may see a trotting-sulky that was found in a pyramid of Egypt. You are told it is a Scythian war-chariot —Scythian it may be, but a clearer trotting-sulky I never met. Not certainly a sulky of our manufacture. It is made, axles and all, of wood and leather. Shall we laugh at it for that? Remember it is 3,000 or 4,000 years old, and still is in running order. What kind of order do you think one of Brewster's best 500-pound wagons will be in when it is 3,000 or 4,000 years old? Not even the "deacon's one-hoss shay" lasted 3,000 or 4,000 years. All honor, then, to that Scythian sulky, and to its unknown maker, who, were he now alive, would have a rare reputation for durable work!

Those big-headed horses lived before men had invented vehicles. Nevertheless they were useful animals; their masters ate them, and doubtless killed for their friends the fatted colt. If we no longer eat horseflesh, it is because we are such good Christians. Like the unknown savages of the stone age, our pagan Scandinavian ancestors, eight hundred years ago, thought it the best of meat, and served it at the feasts of Odin. Hence it became an abomination to the early Christian converts, who transmitted to us their religious prejudices; and only of late years, and in certain parts of Europe, has it been added to the list of foods.

The lesson goes slowly on. One after another, animals are domesticated, and, at last, comes the discovery of agriculture proper,—the idea that a seed well planted and tended will yield many fold, whereof a part may be kept for next season and the rest may be eaten. The ruins of so-called lake dwellings, covered for long ages with water, have revealed the beginning of such culture in Europe. Among the charred

piles which once supported wooden cabins built in a lake, have been found bones of oxen, dogs, and goats; and, beside them, heaps of wheat and barley. No writing, monument or tradition remains to tell us who were these primitive tillers of the soil who thus sought safety from enemies amid the waters. By their implements, fished up in quantities from the bottom, we know that some of them still maintained the good old fashion of stone tools; while others more ambitious were able to cast instruments of bronze; another lesson from Mother Earth who yielded her copper and tin for the melting-pot.

They were barbarians, with the manners of barbarians; and it is safe to infer that women did all the field-work, and held undisputed possession of what the French call "the sacred right to labor." The man goes into the Swiss forest, intent, with flint-headed arrow, to slay a red deer; the woman must till the field, and be back in good season with a bundle of firewood to boil the venison which her lord may eat while she dresses the hide with a stone scraper. To her the duty of gathering, quartering and drying the wild apples for winter use; their fragments have been found, prototypes of apple-sauce! She must bring in the grain from the small clearings and store it safely in the lake dwelling, under the eye of its master, who sits lazily chipping a pebble, whereof he will fashion, by some weeks of labor, a spear-head. That woman wrought better than she knew! While, perchance, her thoughts were only on her barbarian finery—her bronze bracelets and hair-pins—she was founding an ever-glorious reputation as the discoverer of agriculture. It passes my comprehension that writers on woman's rights and woman's superiority have not earlier hit on this capital fact—woman was the discoverer of agriculture. The classic nations recognized it. Ceres of the Romans, Mysia of the Greeks, was not a god, but a goddess, who taught the uses of corn. On the eve of her festival the women drove out of the temple men and dogs, shut the doors, and had a good time by themselves. Alas, genius lives on unconscious of itself! Woman planted and garnered all through the last of the stone period and beginning of that of bronze, unconscious that her praises would be sung, ages afterwards, by the Norfolk County Agricultural Society. When she quartered and dried those sour wild apples, did she

dream of pomological clubs? Did she suppose it would ever be possible to propagate three hundred varieties of pears? There is encouragement to be drawn from such late recognition of genius. Perhaps we, without knowing it, are doing something very remarkable which will only be found out several thousand years hence. How delightful to feel that several thousand years hence we shall be fully appreciated!

And thus mankind had fairly learned something from the earth: how to put in the seed, and to gather the increase; how to seek the hidden metals, copper, tin, and afterwards iron. But, like the country lad who thinks he can learn enough in two quarters' schooling, mankind thought that wheat and game and wild fruits were enough to find out, and sat down for an indefinite rest. Thus, at least, did our ancestors; and why should we trouble ourselves about those of other people? We might as well confess now, as later, that our ancestors,—the Jutes, or Saxons, or Germanni, or what not,—were the slow boys, the dunces of the family. For years and years they fought and idled until good Mother Earth thought they never would learn anything. Down to the time of the Christian era they had not even a history, and then their history was written by two foreigners, Cæsar and Tacitus. It is a wholesome discipline to our vanity to reflect that when the inhabitants of Greece and Italy were at the height of their civilization, our progenitors went half-naked, and were scarcely more tamed than American Indians. They lived on game and on the milk and cheese of their domesticated animals. Agriculture they scorned, as a trade that took away a man's mind from the only noble exercises, war and hunting. Were we to meet one of those Germans, with his rough spear and shield, an untanned deer's hide flung across his shoulder, and his long red hair tied in a knot on top of his head, it would stick in our throats to exclaim reverentially: "Thou art my grandfather, fifty-four times removed." And had he been thus addressed he would not have understood. His rude tongue had a small list of short, pointed words, like "good," "bad," "kill," "blood." In their altered forms they still exist with us; and it is a notable fact that when a man is in a towering rage he betakes himself to the short, fierce words of that grandfather, fifty-four times removed; whereas,

if he be calm and gentle, and especially if he be addressing a young ladies' Sunday school, he is sure to use the French, Latin and Greek derivatives wherewith he has painted and padded the gnarled old stock. Not forever were those tall barbarians to stalk through the dark forests of beech and fir. Their destiny was written on a golden tablet, and a power stronger than the sword—the power of Christianity—was to bring their proud knee to the neglected earth. From the Catholic missionaries and monks of those remote times came the first lesson in agriculture to their savage neophytes. It was a little spark, but the wood of the beacon lay ready and blazed with a clear and increasing flame. In this and in all other arts they have ever since gone rapidly on with laborious study and untiring toil. These slow boys bent at last to their task, and after eighteen hundred years of schooling, they have beaten the spry, quick boys, and stand at the head of their class. Not alone in their native plains of Germany, or among the sand dunes of Jutland, or by the fiords of Norway, are these Northmen now found. They are everywhere, from Iceland to Australia; from England, through America to Hindostan.

And now let us ask how, from such mean beginnings, they have come to results so grand. Plainly the power lay coiled within them like a spring, which begins to push when the clamp is taken off. But what special working had that spring by which it came to beat other springs? The answer is, that the Germanic mind is a scientific mind, and has always been so from the day when its form grew to be recognizable. What is scientific, and what is science? They are words on every tongue, yet not one tongue in twenty will answer the question aright. The nineteen wrong tongues will hasten to say that science first may be defined as the opposite or the complement of practice; and, secondly, as abstract theory based on thought, and distinguished from working based on experience. Why run so far for a reply and put it in so many words when a short one is at hand? "Science" is *knowledge*, and "scientific" is *knowing;* just that, and nothing less or more. The mind of the Northmen has grown great and strong, because it is knowing, and still seeks knowledge.

To descend from generals to specials, and from greater things to smaller, we cannot hope to thrive in agriculture except by holding to the working method of our race; we must be scientific, having and eagerly seeking knowledge. There are too many men who fall away from this method, and prop themselves against one of the stupidest sayings ever invented by an idler: "What was good enough for my father, is good enough for me." They are like those lake people we were talking of, who thought that wheat, dried apples and a bronze hatchet were sufficient for any family, and who, so far as we know, never got beyond these simple supplies.

You tumble against such folks at every turn; and a deal of hauling and pushing it takes to get them out of the way. Last winter, a number of learned men asked the legislature for an annual grant for making a proper survey of this Commonwealth. Our friends of the bronze period awoke at once from their customary doze. "What, what, what! A survey! Have we not town, county and state maps already? Did our fathers complain of them? No, no! This is a device to pay a parcel of scientists who want to wander over the earth with muck-rakes!" So the petitioners had leave to withdraw. As a fact, there is no such thing in existence as a map of Massachusetts. There is a sheet of paper, painted with divers colors, and covered with lines which mean roads, and with dots which signify towns. But that is not a map; it is rather a perfecting of the shingle with chalk-marks wherewith the countryman indicates to you the way to his father's wood-lot. When we consider that, for every important problem of drainage, road-making, mining, manufacturing, water-supply and agriculture, an exact topographical map is essential, the petitioners would seem to have been in the right. There is no country of Central Europe, however small and poor, that does not possess a topographical survey. Our sister republic, Switzerland, has a topographic map which is a model in its way. She has mountains fourteen thousand feet high, whose every crest and ravine is there minutely laid down; while we, with no hills that a child cannot climb, stay content with our improved shingle and chalk-marks. All this comes of want of knowledge or science. And thereby we are led to ask, What is a scientific man, and how may we know him?

A scientific man, like a gentleman, is rare, but may be looked for in any station or class. I know that all males are in this country called gentlemen. Call them what you please; my experience is that a gentleman is rare in this and in any other country. So our man of knowledge, of science, may be looked for anywhere. Does a man's lettuce head better than his neighbor's—he is scientific, knowing. When you examine him, you find he knows just how many inches to open the frames at such and such a temperature; when to water and when to leave them dry; how to keep lice and mould away; and how to maintain a long, steady heat. Does a man have the best cows,—he, too, is scientific; for a good cow is no matter of chance. He has stared at cattle till he knows their points by a sort of instinct; he can rise above the limits of breed or grade, and can tell an animal on her own merits; can say whether she runs too much to beef, or has not the constitution to keep up her milk, or is too closely bred. The two men have one trait in common,—they are one-sided; they are specialists. The lettuce-grower could not tell a fifteen-quart cow if he died for it; and the cattle-breeder would scald his lettuce before February was out. Knowledge is great, and one student, though he be talented, can master only a bit. Every scientist, therefore, is one-sided. He is all lettuce, or all cow. With this preface, we are prepared to place and to appreciate what are called, with improper exclusiveness, "scientific men"; to wit, those who follow a subject, not for the profit of it, not even that they may teach it, but that they may *know* it. Such men must of course be specialists, and one specialty is scientific agriculture. We must not expect too much of scientific agriculturists. They are human and can know a part only. If they work all day with test-tube and reagent, they cannot be expected to "point out" a swarth as well as a country lad who never got beyond the rule of three. This advantage, however, is theirs: that they arrive at a result more rapidly and reliably than men of slight education, because they do not try problems already solved, and because they compare thousands of facts where the others compare tens.

We have noted how ancient is the tilling of the soil, and how slow has been its improvement. Nevertheless, each

improvement was the act of somebody who refused to be contented with things as they were, and who studied to find something new and better. How long mankind delved with sharp sticks, we know not. At any rate, the day came, the day when a grand genius was born. He gave his mind to the study of sharp sticks; and at last (perhaps when he was gray-haired) hit on this discovery: that if you held a sharp stick upright and fastened it to a horizontal blunt stick, you could drag the sharp upright by the blunt horizontal, and thus scratch the ground—in fact, you could plough. There are nations, like the Persians, who have never ceased to gaze with awe on this invention, and who still use it. Others there are, who have improved it until they have reached steam-ploughs and gang-ploughs. Let us side with the latter nations, and never say of any tool, it is good enough. Let us encourage all sorts of research; but especially that of highly educated men, for of them is our best hope. Good examples are not far to seek. Look at Germany. Perhaps somebody will object to looking at Germany, on the plea that it is the land of privileged classes and of military rule. True; but remember, we are talking of crops, and not of nobles and soldiers. A man may have a bad temper, and yet raise excellent string-beans. We do not scorn to drink tea because there is a Tai-ping rebellion in China. Therefore, we look into Germany, and, after getting through the stratum of nobles and soldiers (who, it may be said in parenthesis, have thoroughly studied their trade of killing and have brought it to the fine point of perfection), we shall find a people who have perhaps more knowledge than all the rest of the world together. Not that they are a fine-grained or a well-to-do people; on the contrary, one is struck by a certain coarseness, and by a general lack of means; but in knowledge and research, they are to-day the world's leaders. Their governments are well known as exceptionally thrifty and economical, insomuch that when a man is said to "work for the king of Prussia," it means that he works for nothing. If, then, these governments support certain establishments, we may be sure they expect much advantage from them. And now look at their establishments for the study of agriculture. The last statistics tell us that Prussia proper has ninety colleges, academies

and schools of agriculture in which every branch is taught with extreme detail, including crop-raising, grape-growing, horse and cattle breeding, fish-culture, drainage, forestry, and the care of bees; all these in addition to original researches in chemistry and in other pertinent sciences. Of these colleges the four highest have eighty professorships, and those of lower degree are proportionately supplied. One academy, that of Proskau, has attached to it seventeen thousand acres of tillage and forest. The little duchy of Baden, with a population less than that of Massachusetts, has twenty agricultural establishments; and, in the entire German empire, the people are taught nearly on this scale. Perhaps some one will ask, What has this vast network of scientific schools brought to pass? What has this army of highly educated and spectacled professors to show, in exchange for their apparatus and salaries? Already I have said that German officials keep a sharp eye on their penny's-worth. Being themselves well scrimped, they are determined that nobody else shall grow too fat, or get pay without full return. A Prussian employé who should leave his post and run to Berlin to look after politics and offices, would first be discharged and afterwards clapped in prison. Sometimes I think that a little of such tyranny might have a wholesome effect in our country.

The case before us makes no exception to the rule of thrift. These professors have earned their wages. They found a country that produced scanty crops of oats, barley and white wine. To-day they show you an abundant yield of everything their soil and climate will allow. Cultures that were feeble, such as those of wheat and sugar-beets, have grown to grand proportions; waste lands have been reclaimed; forests planted, grown, and cut according to rule. Nobody there dares sell a false manure with the Argus-eyes of a professor of chemistry ever on him. It will not avail him to publish a ten-dollar analysis from a private assayer. The government chemist says: "Empty out your bags here, and let us examine their contents. If you have been swindling the farmers, to jail you go!"

Are we speaking of a land naturally fertile and of a favoring climate? Not so. North Germany is a dreary plain,—the

gravelly, sandy bottom of an ancient lake. South Germany is rugged with mountains. The climate, over a good part of the entire region, is damp, chilly and tormented by bleak winds. But a persevering and intellectual people have kept on learning that lesson of Mother Earth; and she has plenteously rewarded them according to their deserts. Here are guide and encouragement to us poor occupants of a country that long ages ago was subsoiled by the glaciers; and a glacier, let me tell you, is a plough that subsoils a little too deep and brings all the gravel and rocks to the top. Our German cousins, however, are every whit as ill off; and yet they make the crops grow. We will not sneer at our own efforts. It will not do to sneer at such shows of fruit and vegetables as we to-day have seen. But let us all in all honesty confess that we are partial farmers, working much by rule of thumb, doing some things extremely well, and failing childishly in others. Our agriculture is nowhere thorough and well proportioned. Here is a man who will raise prize strawberries, and his apple-trees, hard by, will be full of caterpillar webs. Another excels in onions, while his starved potato-field is buried with weeds. In these respects our transatlantic friends do better. You may start from Florence, in Italy, and walk for miles along the valley of the Arno, without seeing a fruit-tree cut by insects, or a weed in a vegetable bed, or a square yard of arable soil without some crop on it. It may be that the peasants are driven to careful husbandry by poverty, and that they work with antiquated tools. At all events, they give a lesson to us who have money and fine implements.

REFORM IN THE MANAGEMENT OF AGRICULTURAL SOCIETIES.

ESSEX.

From an Essay by Francis H. Appleton.

Where is reform needed, and how shall it be brought about? I think I can safely say there are comparatively few members of the Essex Agricultural Society who do not need reform in their conduct as members.

According to the by-laws, a committee is appointed at the annual meeting, by nomination from the floor, consisting of one member from each city or town, whose duty it is to meet before the first of the following July, and nominate a list of officers and trustees to be voted for at the next annual meeting. Each member of the society should therefore take the greatest care to have a public-spirited man, of unquestionable character, to represent him on this committee.

With a committee thus carefully appointed, none but the best officers could be nominated, and it would be better for us always to vote the society's regular ticket.

It must be remembered that the trustees have power to do what they please with the funds of the society; so it will be seen at once that should an incompetent or selfishly disposed board of trustees ever be elected, they could immediately squander the society's funds in whatever way they chose. Thus the present excellent financial condition of the society, the result of years of care, might be destroyed in an hour.

It is fashionable at the present time to cry reform. While reform is unquestionably much needed in the country at large, it might also be advantageously applied to some customs of our society; but it is of the utmost importance to be sure that the people who cry for reform are honest in their inten-

tions, and are not, at the same time, aiming to gain some selfish end for themselves or their friends at the expense of the public. There exist too many persons of this kind, just at present, and the eyes of unsuspecting people should be upon them.

It is not well always to trust to the opinions of the loudest and most fluent talkers. It is much better to study and form one's own opinions from what we can read and hear.

Do not let personal animosities or prejudices influence us, for often a personal enemy may be one who could best serve us in an official capacity.

Many members take no pains to attend the annual election, and so withhold their counsel in appointing the nominating committee. Every member should make such arrangements as will enable him to attend the annual meeting, and then we should have all parts of the county well represented, which, while it would add greatly to the usefulness of the meeting, would add much to the pleasure of the day.

The most needed improvement at our shows seems to be *covered pens* for the unfortunate animals that now favor the shows with their presence, and have been exposed to the severe storms that have at times taken place. Farmers cannot readily find outside shelter in case of rain or cold, and more often would not care to be put to that expense; consequently, many valuable animals, which would afford excellent instruction, are not exhibited to our farmers. Ayrshires, Shorthorns, Jerseys, etc., will be exhibited only in small numbers until their owners can be assured that proper protection from the weather will be provided.

I am convinced that the society ought not to locate. To locate would simply be suicidal. I would urge all members who have its best interests at heart, strongly to oppose all attempts to locate.

It is impossible for the society to own portable covered pens, or the lumber necessary to make them, on account of the expense of transporting them.

The New York State Society has, until the last four or five years, held its shows at different places each year, and has had pens, built by contract, of rough boards, which were sold after the show. The boards were but little cut or injured and the

society sustained only a small loss on them. The labor and nails were the chief expense. I do not think it would be advisable, however, for our society to adopt this plan.

The New York Society having attained an excellent financial condition, knowing that their annual show brought many benefits to the city or town where it was held, and desiring better covered pens, and buildings of their own planning, decided to visit certain places regularly every few years where the inhabitants should erect suitable buildings.

These buildings have already been erected in several places, so situated that they are easily accessible from the country around them. By visiting them in turn the good influence of the society is scattered all over the State.

I believe that some such plan might be tried to advantage in this county, and I would respectfully suggest that it be carefully considered at an early meeting of the trustees, in order that their views may be again declared for the benefit of the members. I think that three places could be selected for holding the annual shows, each of which would be central to a third of the county, and at the same time easily reached from any part of it.

Would it be advisable for the society to propose to the city and town authorities of Lawrence, Newburyport and Danvers to visit in rotation said places, provided the citizens would agree to furnish covered pens for all live-stock exhibited, in addition to such arrangements as are now made? Both Lawrence and Danvers have their trotting-parks, where the society would find excellent accommodations, with the addition of covered pens; and I doubt not that Newburyport could provide equally good accommodations should they be willing to attempt it.

Another matter of great importance was brought prominently to my notice this year, when serving on the committee on bulls. All county societies, receiving the state bounty of $600, are compelled to award premiums only to thoroughbred bulls. I found that few of the owners of cattle know rightly what a thoroughbred animal is. Several grade bulls were entered this year as thoroughbreds, their owners confidently believing them to be such. I know of cases where our committee in the past, have awarded prizes to grade

animals in the thoroughbred classes. Such cases should not occur, and our committee should be instructed, in accordance with printed authority from the State Board of Agriculture, exactly how it shall be ascertained whether an animal is thoroughbred.

When *all* the ancestors of an animal can be proved to have been imported from Ayrshire, or to be descended from animals imported from Ayrshire, such animal is a *thoroughbred Ayrshire*. When in this case an ancestor cannot be proved to be a thoroughbred, such animal is a grade. The same rule applies to all important breeds of cattle.

Imported stock has been of the greatest value to this country, and the Massachusetts State Board of Agriculture, as I have said, encourage the use of thoroughbred bulls only, and it is best that only such should be used, that their ancestry may be readily traceable and the quality of their descendants be assured.

The only thoroughbred stock that we have in this country is imported from abroad. The imported breeds should be kept pure; but must we always be advised by the highest agricultural authority in the State to use none but thoroughbred bulls from imported stock? Cannot the Board recommend some carefully matured plan by which we can gradually arrive at a breed of cattle, which shall combine, for example, the richer milk of the Jersey and the greater quantity of the Ayrshire and at the same time be purely Massachusetts, or New England, in its origin?

Why should we not some day in the future be able to export to England a breed that shall prove invaluable there, and be an improvement on their home breeds, thus doing better by them in return for their having done well by us?

It would take time to accomplish this, and as all such results must have a beginning, the longer that beginning is postponed the farther off is the time when success would crown our efforts.

The importance of that noble and companionable animal, the horse, should be kept prominently before the managers of our society, and every possible opportunity should be afforded for showing his capacities to the best advantage. He should

not be allowed to be degraded or cruelly treated, so far as this society has influence to prevent it.

Horse-racing should never be allowed at the shows of this society, and the society should never meddle in any way with it. When properly conducted, horse-racing is a sport entirely separate and distinct from agricultural shows, and in no sense a branch of agriculture. If any member of this society interests himself in horse-racing, let him get all the profit and pleasure he can from it at the proper time and place. Let him select those horses that are sufficiently sound to compete for our prizes, and we shall be only too glad to have them entered for competition at our shows.

Our enterprising farmers, with others, should take such necessary action as will allow this county to be properly represented in the agricultural department of the coming Centennial Exhibition at Philadelphia. They must remember that Essex County, although a small portion of the vast territory of this Republic, occupies a place of no small importance in the affairs of this Commonwealth, and should be made to hold its proper position before the eyes of visitors from all parts of the world. Let the visitors from the more eastern nations, in viewing the show at Philadelphia, see in as many classes as possible that Essex County, with which they traded much in the days of our fathers and grandfathers, is a thriving place, and able to be largely represented. Many articles that may seem trivial to us at home, might be of great interest to foreigners from remote countries, and this fact should be clearly borne in mind. Large quantities of any one article should be avoided, like the huge monument of quack medicine bottles that was exhibited at Vienna in 1873; but many articles of different kinds are wanted.

CHEMICAL CORN-GROWING.

MIDDLESEX SOUTH SOCIETY.

From an Essay by E. Lewis Sturtevant.

In an essay contributed in 1872 to the Transactions of the Middlesex South Agricultural Society, I investigated the cost of a premium crop of corn to the Massachusetts farmer, and among the items of expense, calculated the fertility removed by the crop from the soil. At the present time I propose to report an experiment which will supplement this past method of mine, by showing what may be expected from the application to the land of the fertility which we expect the crop to remove.

We know from the chemical analyses that certain elements are removed by our crop, and a long experience on our New England farms has shown that of the elements removed, but three need concern us, as all the rest are usually contained in the soil in quantities abundantly sufficient for vegetation. Thus, although the corn-crop may remove the following elements of fertility, yet the nitrogen, phosphoric acid and potash are the only materials whose exhaustion from the land is probable under ordinary culture, and are therefore the only elements we need supply.

Professor Emil Wolff's Table.

Percentages.

	Corn (Grain).	Cob.	Stalks.
Water,	13.6	11.5	14.00
Nitrogen,	1.6	?	0.40
Total ash,	1.23	0.50	4.72
Potash,	0.33	0.24	1.66
Soda,	0.02	0.01	0.05
Magnesia,	0.18	0.02	0.26
Lime,	0.03	0.02	0.50
Phosphoric acid,	0.55	0.02	0.38
Sulphuric acid,	0.01	0.01	0.25
Silica,	0.03	0.13	1.79
Sulphur,	0.12	0.13	0.39

A careful examination of the proportion usually existing between the cob and the grain, gives the extreme percentages in 28 trials as 12 and 25, with an average of 18½ per cent. of cob in the total weight of corn in the ear, or about 23 per cent. of the weight of shelled corn. The proportion between the grain and the fodder varies within large limits. A careful examination of experiments reported in the volumes of "Agriculture of Massachusetts," furnishes the following results, arranged according to a series, but calculated to the bushel of crop :—

13	trials	gave	as	an	average	1	bushel	to	83	pounds of stover.
65	"	"	"	"		1	"	to	85	" "
38	"	"	"	"		1	"	to	73	" "
These 116	"	"	"	"		1	"	to	80.8	" "

Selecting from this number what I may call the reliable extremes, we have for the least proportion one bushel of corn to forty-one pounds of stover; and for the greatest proportion, one bushel of corn to one hundred and twenty pounds of stover, both results being for the month of October.

In one experiment, made under the direction of the trustees of the Massachusetts Society for the Promotion of Agriculture, Mr. B. P. Ware, of Marblehead, reports the proportion on five different lots as below :—

1	bushel	corn	in	ear	(72 pounds),	124 + pounds stover.
1	"	"	"		(72 pounds),	110 + " "
1	"	"	"		(72 pounds),	90 + " "
1	"	"	"		(72 pounds),	83 + " "
1	"	"	"		(73 pounds),	85 " "
Average on 40,000 square feet, 1 bushel,						101 " "

As, however, we do not know the date of harvesting, and therefore the state of dryness, we cannot use this table comparatively with any other one statement, but it serves a useful purpose, as indicating the extremes which may be expected between different crops.

The average proportion may be considered, then, as about 80 pounds of air-dried fodder to the bushel of grain, for Northern corn, or about one pound of grain to one and a half pounds of fodder.

A bushel of grain, with its corresponding cob and stover, would therefore remove from the soil, according to the analyses and proportions given above, on an average * :—

	Grain, pounds.	Cob, pounds.	Stover, pounds.	Total pounds.
Nitrogen, ...	.89	?	.38	1.27
Phosphoric acid, ...	.31	.02	.30	.63
Potash, ...	.18	.03	1.33	1.54

The conclusion is therefore irresistible, that *if* this table represents the amount of these constituents removed from the soil by our crop, then this table represents the actual exhaustion of the soil by the removal of our crop; and the inquiry may well be pressed farther, and the question broadly put, Why will not the application of these amounts of these constituents on any land favored by temperature and moisture, produce a bushel of grain?

Before answering this query in the affirmative, as does Professor Stockbridge, of the Massachusetts Agricultural College at Amherst, and whose success in practical experiments, carried out under this theory, for the past two or three years, entitles it to respectful consideration, let us consider whether there is any loss of material during the growth of the crop, or in other words, whether a greater quantity of fertile elements must needs be applied, during the growth of the crop, than is to be found in the crop at maturity.

The first essential of an agricultural experiment is, that it shall be so carried out as to eliminate all possible sources of error, and that the result may be given in terms which are unmistakable,—a definite reply to a definite interrogation of nature. Fortunately for our purpose, we have in water-culture a means for arriving at a knowledge of the elements and proportions requisite for maturing a corn-plant.

According to the experiments of Stohmann, the maize-plant grows to full maturity, if, in the beginning of May, the seed

* As the analyses of the roots, and the quantity of root is unknown to me, I omit this portion of the plant from consideration; and this is of less consequence, as the roots are never removed with the crop.

which has germinated in water, and has shot forth roots, is placed in a solution containing the food of the maize in the proportions in which they exist in the ashes of the plant, if at the same time there has been added to it, so much nitrate of ammonia, that to every part of phosphoric acid in the solution there are two parts of nitrogen, and if finally it has been diluted with distilled water to a concentration of three parts of solid matter per 1,000 parts. In this manner may be matured fully formed plants which attain a height of seven feet.

We are therefore justified in believing that the corn-plant will grow and mature its crop, when supplied with food of the character and proportion as found in the plant.

Again, if we examine with care the experiments of Knap, another reliable German experimenter, not only is our conclusion justified, but we have an additional fact of interest; viz., that throughout the period of growth, the phosphoric acid supplied, was all absorbed by the plant, while the amount of potash assimilated was far more variable. This would lead us to suspect that more of the potash is as accidental ingredient of the plant, than of the phosphoric acid. In other words, that circumstances might determine the plant to absorb more potash, in excess of its real requirements for grain growing, than of phosphoric acid, and if this were so, to indicate this change, by a greater or less amount of foddering.

Result of Knap's Experiment with the Maize Plant.

In column A is given the quantity of the material received by the plant at a particular period. In column B is given the material found in the solution at another determinate period. In column C the difference, or the amount absorbed by the plant.

Phosphoric Acid.

PERIOD.	A. Gramme.	B. Gramme.	C. Gramme.
1. May 12 to June 12, ...	0.0750	–	0.0750
2. June 12 to July 20, ...	0.0625	–	0.0625
3. July 20 to July 27, ...	0.1250	–	0.1250
4. July 27 to Aug. 1, ...	0.1250	–	0.1250
5. Aug. 1 to Aug. 10, ...	0.1875	0.0020	0.1855
6. Aug. 6 to Aug. 16, ...	?	0.0010	?

Potash.

PERIOD.	A. Gramme.	B. Gramme.	C. Gramme.
1. May 12 to June 12, ...	0.6131	0.2280	0.3851
2. June 12 to July 20, ...	0.5110	0.3120	0.1990
3. July 20 to July 27, ...	0.5518	0.2160	0 3358
4. July 27 to Aug. 1, ...	0.5518	0.1296	0.4222
5. Aug. 1 to Aug. 10, ...	0.5927	0.1894	0.4033
6. Aug. 10 to Aug. 16, ...	?	0.0160	?

We would call attention to the interesting fact, that more potash was absorbed in the earlier periods of growth, than phosphoric acid ; as potash is a large constituent of the foliage, this is as we should expect. Note the following table :—

Ratio of Phosphoric Acid to Potash.

Period 1, ...	1 to 5
" 2, ...	1 " 3
" 3, ...	1 " 2½
" 4, ...	1 " 3
" 5, ...	1 " 2
Ratio for whole period of observation as	1 " 3

Let us follow up this hint, by observing the proportions of our chemicals that are removed by differently foddered crops.

Removed per Bushel of Grain, in Various Fodder Ratios.

(1.) 1 pound grain to 2.54 lbs. fodder.—1.58 lbs. nitrogen, 84 lbs. phos. acid, 2.56 lbs. potash. Relation of phos. acid to potash, 1 to 3.

(2.) 1 pound grain to 1.4 lbs. fodder.—1.27 lbs. nitrogen, .63 lb. phos. acid, 1.54 lbs. potash. Relation of phos. acid to potash, 1 to 2.4.

(3.) 1 pound grain to 7 lbs. fodder.—1.08 lbs. nitrogen, .48 lb. phos. acid, .88 lb. potash. Relation of phos. acid to potash, 1 to 1.8.

It will be observed that (1) in the table, represents the results (approximately) as derived from the experiment of Stohmann ; (2) represents what we have given here as the average result ; while (3) represents the reliable minimum result as given above. We would also call attention to the fact that while the increased foddering of the crop increased the nitrogen but from 1.08 to 1.58 pounds, and the phosphoric acid from .48 to .84 pound, or less than double (accurately,

$1\frac{3}{4}$), the potash is increased from .88 to 2.56 pounds, or nearly three times.

These experiments of Knap's are of interest, as they indicate that there is no loss of fertile elements during growth, at least so far as phosphoric acid is concerned; while compared with our results, as given in fodder ratios, the same fact is not only indicated with reference to potash, but the additional fact, that potash may be absorbed largely in excess of the needs of the plant, under given conditions.

We thus see, that if the plant can be grown to maturity in water-culture, by means of chemicals alone, as established by Stohmann, and that there is no loss of chemicals from the plant during growth, as indicated by Knap, our proposition is theoretically established, that if the chemical elements of the crop are supplied in proper form to the *plant*, we may obtain them again in an organized form through the agency of cultivation and care.

We may also add another proposition: that if we should apply the chemicals for our crop, we should look for our results in the entire crop, and not in a portion alone. We cannot prophesy the amount of grain that a given amount of chemicals may grow, because so much depends on the variety of seed, and the season. If a given portion of the fertilizer, beyond what is essential to the plant as a grain grower, is determined through the agency of season or heredity to the leaf and stalk, then that portion is lost to the grain. Hence the uncertainty in practice of predicating results which must follow from unknown conditions.

This seeming solution of the question, however, is very far from being a practical one. It is easy to supply our chemical elements to the *soil*, but can we supply them to our *plant?* The question of the economical use of commercial fertilizers depends upon the answer to this question. If we may so supply them, chemical farming becomes a possibility, and may well compete with dung-heap farming, and with a greater probability of successful results to be derived from the application of the fertilizer.

If we should make a solution of our chemical, and apply it to our soil, we would find an action of the soil taking place, of great interest towards the solving of our problem. The

alkaline salt* would be decomposed, and the base would be seized upon and held by the soil as it came into contact with its particles. Thus, if our solution contains sulphate of ammonia and muriate of potash, then the soil decomposes these salts, retains within its pores the ammonia and potash, and allows the acids to pass through with the water, in new combinations. Each soil has, however, a certain retaining power, and while one might fix the ammonia or the potassa within a distance of one inch of filtration, another soil, with less affinity towards these bases, might allow the bases to be carried down two inches or more. On account of this peculiarity of action, we cannot feel assured that our chemicals are evenly distributed throughout the layers of the soil, and we *know* that in order to obtain a theoretically perfect crop from a theoretical field, the earth of that field must contain all the elements of fertility in a soluble form, distributed evenly throughout the whole root pasturage.

If a field be barren, therefore, of all the useful constituents, we might apply to that soil the elements removed by a bushel of corn, with its stover, and yet not receive back our bushel of corn. For the bases being retained by that portion of the soil in contact with them when they came into solution, are not evenly distributed through the land, and there must necessarily be places from which the plant would derive no nutriment; and we cannot imagine the roots of the plant in contact with every particle of the soil, or coming within reach of *all* the chemicals; moreover, the applied salts may have become in part insoluble through chemical actions originating from within the soil.

To obtain a theoretically perfect crop, the roots of our plant must, at all times during the period of its growth, be in contact with soluble food, and this in the quantity sufficient for its purpose. If, therefore, a soil should contain enough nitrogen or potassa or phosphoric acid to yield fifty crops of grain, and yet so scattered through the soil that at no time would the roots be in contact with enough soluble matter to satisfy the needs of the plant, then the plant is less flourish-

* A chemical salt is the material formed by the union of an acid and a base. Thus muriate of potash is a salt, and is formed by the chemical union of muriatic acid and the alkaline base, potassa.

ing, and the crop is diminished over what it might be were the conditions reversed. Indeed, Baron Liebig asserts, that a soil must contain at least twenty-five times as much phosphoric acid as is required by the plant, *before* we apply the extra amount as a manure for the plant. The nitrogen of barn-yard manure seems to be far less effectual, according to the Rothamsted experiments, than the nitrogen furnished by pure chemicals, and even chemical nitrogen must be applied for at least three times the necessities of the plant; *i. e.*, the plant removes but one-third of the applied nitrogen.

We can usually find more phosphoric acid and more potash in our soils than can possibly be required for the use of one crop, yet despite this, the crops fail. This is, perhaps, the normal condition of our New England cultivated fields. The soluble constituents of fertility are present in the soil in absolutely large amount, but as absolutely in quantities so small compared with the bulk of inert matter, that in a given root-area not enough is afforded to the plant for continuous growth. That the soil should contain fertile elements in large abundance, is necessary for the continuance of a succession of crops, and these considerations may explain why it is more expensive to bring up a "run down" field, than it is to continue it under good culture after it has received condition.

If, therefore, we should add to a field whose fertile constituents are present, yet too widely distributed for the roots of our plant to collect, the elements necessary for a full crop, and all these elements in such a form and in such a condition that they may be within reach of the plant throughout the season of growth, we should expect results, not accurately representing a balance between fertility supplied and removed, but proportionate to the amount supplied and the fertility already existent, but just below the minimum requisite amount in the soil; this result only, be it understood, being predicated on known conditions of plant-habit and plant-yield. To illustrate: In the corn plant, the size of ear and the number of ears on a stalk, are largely determined by variety of seed. No matter how much fertility be supplied to a given crop, the yield cannot be proportionately increased beyond this limitation of variety; for the number of ears cannot be increased, and their size but very slightly, if at all, by an

excess of nutriment over what is sufficient nutriment. Hence, if our seed be planted at too great distance, or too few stalks in the hill, no matter what the manuring, the yield may be inferior to the capacity of the soil. Suppose our plants are of a one-ear-to-a-stalk variety, and are planted three feet apart, and three stalks in a hill, and that each stalk bears its one ear, or the whole acre 14,520 ears of corn, no matter what manure we apply; then, if these 14,520 ears are small ones, our yield will be forty-eight bushels to the acre. Suppose, now, we have manured so that each of these ears is of medium size, then our crop is eighty-one bushels. If we manure sufficiently, so that each of these ears is of large size, then our crop is 114 bushels per acre; and we may pile on our manure after this point is reached without increasing the yield. If but two stalks had been planted to a hill, instead of three, our results would have differed by about one-third, and if the number of stalks in the hill had been doubled, our indicated crop is doubled.

We have now seen that, working backward, the yield of a given area is determined in part by the variety of seed, in part by the conditions of planting, in part by the condition of the land before the fertilizer is applied, in part by the fertilizer, in part by the chemical relations between the soil and fertilizer. Under this condition of things a prophecy of yield predicated on but one of these elements, must, even if, in some cases, by chance correct, in the majority of instances be futile, especially if yields larger than ordinary are anticipated.

Peculiarities of condition have, however, led Prof. Stockbridge into broad enunciations of practical formulæ for practical men, and in claiming that the fertility removed by a crop, being applied for a crop, will produce the crop, he has perhaps struck the key-note to as much practical truth as he could crystallize into one sentence, where limitations must be overlooked, as tending to weaken the effect upon those to whom he talks.

It is part of my plan to furnish the details of an experiment carried out in the growth of corn upon fertilizer, applied in the manner and in the quantity recommended by the professor. Although confining my remarks to the details, and the lessons derived from this field, it may be well to mention that we

have concordant results in a field of nine and a half acres, on the more retentive natural grass-land of Mr. E. F. Bowditch, and also equivalent results on two fields,—in all, seven and a half acres,—planted in like manner by Mr. Edward Burnett, of Southborough. Perhaps these twenty-five acres, cultivated as an experimental crop, in fields of the area given, represent the largest area ever devoted to an experimental crop in New England, and the results must possess value as being thus freed from local circumstances and circumscribed conditions, which in small plots are so apt—nay so certain—to obscure the results.

The field in experimental corn on Waushakum Farm, this year of grace 1875, occupies a plain, with a depression running through the centre, and is bounded on the west side by a stone wall, on the north by the highway, on the east by woodland, muck-land and mowing in about equal lengths, and on the south by woodland. The area is eight acres. The soil a gravelly loam on gravel, for the most of the field, but runs to a limited area of muck-land in the depression. A considerable length along the bounds is sapped by the roots of neighboring trees, and the wood on the south side affords shade over a considerable space, at certain hours of the day. The field has been in sod since 1872; and previous to this date, crops of corn, fodder-corn and oats had been taken from dunged portions of the field. The 1874 crop of hay was light, scarcely half a ton per acre being harvested, while an adjoining piece of this field, apparently in similar condition, and left in grass, yielded this year a scant one-third of a ton by estimate.

In May we commenced operations on the land, by ploughing a broad furrow seven inches deep, with a Holbrook swivel-plough; using our horses for this labor in the mornings only, and in the afternoons easing them by lighter farm-work. A careful record has been kept in hours of the time of men and horses employed on, or in connection with, this field, and it has been our intention to take no account of "spunt work" but to try and obtain for our own information, for future use, the actual cost to us of working the crops.

We purchased our fertilizer of Messrs. Jackson and Bowker, No. 53 North Market Street, Boston, gentlemen on

whom we could rely: receiving the article we purchased, and of the composition as stated by them.

Three thousand two hundred and thirty-two pounds of sulphate of ammonia, containing 18 per cent. of nitrogen, at $2\frac{3}{4}$ cents a pound, $= 26\frac{2}{3}$ cents a pound for the nitrogen.

One thousand two hundred and eleven pounds of muriate of potash, containing $55\frac{1}{3}$ per cent. of potassa, at 3 cents a pound, $= 5\frac{2}{3}$ cents a pound for the potassa.

Four hundred and forty-two pounds of sulphate of potash, containing 23–25 per cent. of potassa, at $2\frac{1}{2}$ cents a pound, $= 10\frac{8}{10}$ cents a pound for the potassa.

We would here call attention to the difference between purchasing high and low grades potash salts. As the supply of muriate of potash, or the high grade kainit was exhausted from our market, we had to fill out our potash with the lower grade sulphate. We had, by doing this, to pay nearly double per pound for the 102 pounds of potash contained in the 442 pounds of sulphate, than we did per pound for the $645\frac{8}{10}$ pounds of potash in the 1,211 pounds of muriate.

We then purchased 1,061 pounds of bone-black, at $25 per ton; 530 pounds of sulphuric acid, at $2\frac{1}{8}$ cents per pound; paid $1.60 freight. We now mixed our bone and acid, and produced 1,591 pounds of superphosphate, containing 18 per cent. of soluble phosphoric acid, as Prof. Stockbridge assures us, and as is also indicated by the analysis of a similarly made article by Prof. Storer at Roxbury. The total expense of our superphosphate was at the rate of $35.22 per ton, or slightly under $9\frac{8}{10}$ cents a pound for our phosphoric acid.

In 1874 the price in Germany and abroad for the materials we have used as below:—

Nitrogen in form of ammonia,	$29\frac{8}{10}$ cents per lb.
Phosphoric acid, in higher grade superphosphate,	$12\frac{9}{10}$ " "
Potash in high grade kainit,	$4\frac{3}{10}$ " "
Potash in low grade kainit,	$3\frac{7}{10}$ to $9\frac{5}{10}$ " "

Of course the difference between the prices here and in Germany for the potash salt, is largely dependent on the cost of transportation and handling, and a low grade salt will have its price per pound for the potassium oxide which it contains, more enhanced through costs of moving, than will the potassium oxide in a high-grade salt.

These fertilizers were thoroughly screened and mixed on a smooth floor, and applied to the land after it was harrowed, in two portions; the first, consisting of twelve barrels, through the agency of a broadcast seed-sower moved by two horses. The second portion, of twenty barrels, was *strewn* by hand across the hills, as determined by the marker, which was previously used.

The corn was planted the first of May, in hills thirty-eight inches apart, and either four or five kernels in the hill. On account of the drought then prevailing, the seed germinated very unequally and very slowly, and about three weeks elapsed before the rows could be determined through the sprouting of the grain. The variety was an eight-rowed corn, with small cob and large yellow grain. There were two hoeings of the field, and the cultivator was run one way through the rows, previous to each hoeing.

The following notes may be made of the growing crop: June 20, the corn-plants short, but healthy-looking; July 20, corn very much foddered, almost too thick and luxuriant a growth, as we fear the plant will run to leaf, rather than grain; August 8, the field shows very much more fodder, nearly double that of the manured field at the other end of the farm, but the ears do not appear as numerous. Average height about nine feet, or possibly a trifle more; September 17, commenced cutting and stooking the corn.

The season has been on the whole propitious for corn, and all the corn-fields in our neighborhood are looking far better than usual. Since the early drought, the rains have been frequent, and although the nights have not been as warm, for the most part, as farmers would consider desirable, yet the maize-plant has abundantly prospered in growth, and the only drawback has been the delay in ripening, which compels a rather earlier harvesting than is desirable. On the night of September 21, there was a heavy frost, the thermometer marking twenty-nine degrees under the house piazza.

October 11, we harvested and husked the two unmanured rows on the west border of the field. These rows were 72 rods long, and, being 38 inches apart, represent an area of 27.6 square rods, or $1\frac{5}{8}$ acre.

Merchantable corn, ...	3.77 bush. of 72 lbs.
Unsound corn, ...	2.46 " of 72 "

Or a yield per acre of 21.8 bushels merchantable, and 14.2 bushels unsound corn.

October 23, the committee viewed the field and report the yield as 82½ bushels of 72 pounds per acre.

That is, we have the following statements of fact:—

We applied sufficient nitrogen for . . .	60½ bush. corn per acre.
" " potash " . . .	74 " " "
" phosphoric acid " . . .	66 " " "

According to Professor Stockbridge.

We obtained 82½ bushels of corn per acre.

We have for natural yield of the field, 21.8 bushels per acre. Difference, 60.7 bushels per acre. And this difference is claimed by Prof. Stockbridge as representing the efficiency of the fertilizer applied.

The total expenditure in labor and cost to date, October 12, has been as follows, estimating the labor of a man at 18 cents and of a horse at 9 cents an hour:—

	Man Labor. Hours.	Horse Labor. Hours.	Total Cost.	Cost per Acre.
Breaking up, . . .	33	66	$11 88	$1 49
Harrowing, . . .	20	40	7 20	90
Fertilizer bill, . . .	–	–	228 93	28 62
Freight bill, . . .	–	–	4 60	57
Mixing fertilizer, . .	27	–	4 86	61
Applying fertilizer,* . .	7½	15	2 70	34
Planting, ...	124	10½	23 27	2 91
Two hoeings . . .	151	37	30 51	3 81
Cutting and stooking, .	157	–	28 26	3 51
Total, ...	519½	168½	$342 21	$42 76

* Applying fertilizer in hill was included in labor of planting.

The charge for the labor of a man cannot be questioned, as 18 cents an hour is $1.80 a day, or $46.80 a month of 26 days; as this is somewhat more than we pay for a month of 30 days, our reckoning here is slightly in excess of the truth.

The cost of horse labor to the farmer may well receive discussion here, as I can find scarcely two farmers who agree

upon the exact amount which should be charged. If we should call this labor 20 cents per horse per hour, as some claim we should, it would add but $2.31 an acre to our cost as given. Were it not for the principle underlying the question of how to report a crop, I should leave the matter here with the larger figure, for there is no disposition to lower the cost of our crop, but rather to obtain for ourselves the exact cost, and if we must err we would prefer to err in charging the crop more in preference to less than its deserts.

I hold the cost to the farmer is not the letting price of a horse, but the cost of keeping a horse. It is not his business to take the risks of a livery stable, and let his animals, and therefore he should not charge his horse labor to himself at those rates which are regulated by principles which are far from those which govern the use of a horse on a farm. The farmer looks to his farm for his profit, and uses the horse. The livery man gains his living from the letting of his horses, and the principles which would regulate the charges are unlike. The true cost of horse labor to the farmer is the interest on the first cost of his horse, an annual depreciation account, wear and tear of harnesses, teams, implements, etc., depreciation account of the same, care, and the cost of the food consumed. The credit to this account is the manure made and the services rendered.

If we take the army ration of the United States in 1861 as a standard for the food consumed, we have 14 pounds of hay and 9 pounds of oats, corn, or barley. With hay at $25 per ton, and corn at 84 cents a bushel, this represents a cost of $2.17 a week. Although this is a war ration, I am disposed to believe that it is rather below the cost of keeping large team-horses during the hardest of farm-work, as during the ploughing season, harvest, etc.; yet perhaps this sum would represent a true average cost for the keeping of the average farm-horse during an average year. For convenience of computation, and in order to not underestimate, we will call the cost $2.25 per week.

Let us assume that the horse cost originally $300, and that the interest account is $21 per year; that the horse will last ten years, and the depreciation account to be $30 yearly. We will also suppose that the cost of the harnesses,

teams and horse-tools is about the cost of a horse; viz., $300, and that the interest and depreciation account is twenty-five per cent. We then foot up the following result:—

Total cost of keeping a horse as above, for one year, . . .	$228 00
Value of horse labor, at 9 cents an hour, per year, . . .	281 70
Surplus, ...	$53 70

And this surplus, and two cords of manure, will be left for the care and shoeing.

In the presence of this preposterously large and wastefully calculated assumption, nine cents an hour for horse labor is not an undercharge for the present year.

Accepting, then, our charges for labor, and our estimated yield, derived from the harvesting of one square rod by a committee, and estimating the amount of stover at twenty-five per cent. more than an ordinary crop; *i. e.*, one hundred pounds of stover to a bushel of shelled corn, instead of eighty pounds, the average, we present for consideration the following provisional account:—*

Total cost of crop stooked in field, ...	$42 76
Estimated cost of harvesting, ...	7 20
Husking at 5 cents a bushel, ...	8 25
Total cost, ...	$58 21
Credit with $4\frac{12}{100}$ tons stover, at $8, ...	33 00
Cost of $82\frac{1}{2}$ bushels shelled corn, ...	$25 21
Cost per bushel, ...	.306

Whether chemical farming is orthodox or not, we feel this year as if we, on Waushakum Farm, had been paid by it; and we know that our two neighbors—Mr. Bowditch, with his nine and a half acres, and Mr. Burnett, with his seven and a half acres—also feel repaid for their trial of the formula this year.

In connection with, and to supplement, this experiment, we kept an account with a smaller field, of naturally better land, and fertilized from the dung-heap. The field contains 2.7 acres, and is situated on the east side of the highway leading

* After the above was in type, an actual weighing showed one hundred and eighteen pounds of air-dried fodder to the bushel of grain.

to Holliston, between the highway and the Milford Branch of the Boston & Albany Railroad. The soil is a gravelly loam, and although in sod for several years, and having been liberally top-dressed, yet the grass had become bound out, and the field, through diminished crops, scarcely worth mowing, showed that tillage was required.

After being ploughed in May, the field received ninety loads of dung. The dung was of high quality, being pure cow-dung, slightly dusted with dirt, and from grain-fed and carefully-attended cattle, and taken from a cellar with a water-tight bottom. As our horse-cart body is five feet long, three and a half feet wide, and fourteen inches deep, and was carried as full as was possible at each trip, the field received 20 cubic feet × 90 loads = 1,800 cubic feet ÷ 128 feet = 14 cords, or 5.2 cords per acre.

The corn planted was a very fine eight-rowed variety, small in diameter, but long; the grain good-sized, bright yellow, hard and compact, with a small cob. A portion of this seed, presented us by Mr. S. B. Bird, of Framingham, it seems to us can scarcely be excelled. The field was planted May 20, and the corn came up in due time, and looked finely throughout the season of growth, showing less fodder and a greater maturity over the chemical fertilized field above described. The field received the amount of labor as given below, the labor rates being calculated on the same basis as before:—

	Man Labor. Hours.	Horse Labor. Hours.	Total Cost.	Cost per Acre.
Breaking up,	12½	25	$4 50	$1 67
Harrowing,	8	16	2 88	1 06
Half of dung, $8 per cord,	–	–	56 00	20 74
Hauling and applying dung,	60	60	16 20	6 00
Planting,	28¼	3	5 40	2 00
Two hoeings,	117	32	23 94	8 86
Stooking,*	53	–	9 54	3 53
Harvesting,	81	54	19 44	7 20
Husking,	–	–	27 00	10 00
Total,	360	190	$164 90	$61 06
Seed,	–	–	–	.30

* As a matter of convenience, a part of this field was topped at irregular times, as the cows required fodder. We therefore assume the labor of stooking as being the same per acre as with the fertilized field. Harvesting is also estimated the same as with the other crop.

According to the report of the committee, the yield of this field is at the rate of one hundred bushels per acre. Hence we present the following account:—

Total cost of crop per acre,	$61 36
Credit with 5 tons stover, at $8,	40 00
Total cost of 100 bushels shelled corn,	$21 36
Cost per bushel,	0 21⅛

One strip of eleven rows of this field was left unmanured. The yield on this portion was at the rate of 68¾ bushels per acre, as below:—

Merchantable corn,	68 bushels.
Unsound corn,	¾ bushel.

Reasoning as with the fertilizer crop, Prof. Stockbridge would say that the 5.2 cords of manure applied to the field produced thirty-two bushels of corn, as this is the difference between the yields of the manured and the unmanured portions of the field.

The question need not concern us, as farmers, whether the fertilized crop is cheaper than the manured crop, or *vice versa;* as farmers, we cannot obtain all the manure we would desire, but we *can* obtain fertilizers in unlimited quantity. Can we use these fertilizers to a profit, after we have used all the manure that we have. Although I propose to compare the items of expense of these two crops, I wish to discard the notion that any attempt is being made to show one system either superior or worse than the other.

Expense per Acre.

	Manured Crop.	Fertilizer Crop.
Breaking up,	$1 67	$1 49
Harrowing,	1 06	0 90
Manure,	20 74	29 80
Applying manure,	6 00	0 34
Planting,	2 00	2 91
Hoeing,	8 86	3 81
Cutting and Stooking,	3 53	3 53
Total,	$43 86	$42 78

We first note that the cost of ploughing was greatest in the manured field. This difference was probably caused by the shorter length of furrow, which necessitated a greater number of turns, and which consumed time. The harrowing is as nearly alike as would be expected from the two fields. The cost of manure represents absolute amounts charged in the case of the fertilizer, in assumed amount in case of manure; of course there is a great difference of expense between broadcasting six hundred and sixty-five cubic feet of manure and three cubic feet of fertilizer. The planting of the fertilizer lot was increased over the manured lot by the use of fertilizer in the hill. The great difference between the cost of hoeings is a real difference. The manure contained seeds of weeds, and furnished them to the land. The fertilizer, on the contrary, was clean. Stooking, harvesting and husking is calculated on the same basis for both fields.

The question will immediately occur to the practical farmer, How will the crop, after chemical fertilizer, leave the land? *i. e.*, will not the condition of the land, through the use of chemicals, constantly deteriorate, until finally no crop can be profitably raised.

A careful examination of the first portion of our essay will reply to this question on theoretical grounds. Provided you apply to the field, each year, the chemicals removed by your crop, your land is ever increasing in fertility; in theory, the longer chemicals are understandingly used, the larger should be each recurring crop, after the chemicals have been used long enough to fairly provide each portion of the soil with soluble ingredients. The explanation, it will be remembered, is simple. In the processes of nature, disintegrations and oxidations are continually taking place in the soil, and minute particles from the stones are becoming thereby soluble. The rains bring down nitric acid and ammonia from the air; vegetable matter is continually in a state of decay; in a word, a field lying fallow grows fertile. Now, if you remove from your land no more than you apply, the balance is undisturbed, and your field is practically fallow. In practice, however, as we have shown, there can be no ratio between chemicals applied to the land in large quantity, and crops removed irrespective of variety and method of procedure. We have

also pointed out that the crop cannot remove from the soil all the fertilizer applied. Therefore, in practice, in applying to the soil what we expect a large crop to remove, we do not obtain necessarily the large crop that we expect, and the balance of fertile element is retained in the soil; or should the large crop be obtained, it is not produced from, although it may be caused by, the chemicals we apply.

However, we can answer this question for the practical farmer, in a practical way. If we look over the experiments at Rothamsted in England, we find on record one experiment in growing wheat on the same land for twenty years without manure. We present the yields in full, as indicating how much fertility may be depended upon to be furnished by climatic and natural influences in each year, from some soils:—

Winter Wheat.

YEARS.	Bushels.	Pecks.	YEARS.	Bushels.	Pecks.
1843–4, . .	15	0	1853–4, . .	21	0¼
1844–5, . .	23	0¾	1854–5, . .	17	0
1845–6, . .	17	3¾	1855–6, . .	14	2
1846–7, . .	16	3½	1856–7, . .	19	3¾
1847–8, . .	14	3	1857–8, . .	18	0
1848–9, . .	19	1	1858–9, . .	18	1¼
1849–50, . .	15	3¼	1859–60, . .	12	3½
1850–1, . .	15	3½	1860–1, . .	11	1¼
1851–2, . .	13	3¼	1861–2, . .	16	0
1852–3, . .	5	3¼	1862–3, . .	17	1

Average for first ten years, 15 bushels 3 pecks; for second ten years, 16 bushels 2 pecks. Average for the 20 years, 16.2 bushels.

The land is what may be called in England, fair average wheat land, and under ordinary management in the district may be rated at from twenty-five to twenty-seven bushels per acre. The soil is a somewhat heavy loam, with a subsoil of raw yellowish clay resting upon chalk, which furnishes good natural drainage.

In another plot, marked 16a in Mr. Lawes' tables, portion of the same experimental field given above, we have the yearly crops, for twenty years, as given below, the manure used being entirely chemical. In transcribing, I give the result approxi-

mately in bushels, instead of in bushels and pecks and fractions of pecks :—

Yield of Wheat per Acre.

YEARS.	Bushels.	YEARS.	Bushels.
1843–4,	19⅜	1853–4,	49½
1844–5,	32⅜	1854–5,	33⅛
1845–6,	23¾	1855–6,	38¼
1846–7,	29¼	1856–7,	48¾
1847–8,	29¾	1857–8,	41¾
1848–9,	33¼	1858–9,	34¾
1849–50,	33¾	1859–60,	32½
1850–1,	36¾	1860–1,	36½
1851–2,	28¾	1861–2,	36¼
1852–3,	24¼	1862–3,	56½

Average for first 10 years, 29.2 bushels ; for second 10 years, 40.8 bushels. Average for 20 years, 35 bushels.

Does this table seem to indicate that chemical farming exhausts the soil? However, we will give another instance of a gentleman in England, who purchased rather a poor farm in 1861, and who, since that date, has sold off his standing crops at auction, and purchased chemical manure. The gentleman is Mr. Prout, and his farm is Blount's Farm, 450 acres, in Sawbridgeworth, Herts ; and a full report thereon may be found in the last report of the Journal of the Royal Agricultural Society of England. [1875, xi. p. 38.]

The following table will explain itself :—

KIND OF MANURE USED.	Value of Manure Applied to Crops.	Reduced to Dollars.	Total of Crops Sold.	Reduced to Dollars.
1861,	–	–	–	–
1862, Chemical	£640 0*s.* 0*d.*	$3,200	£1,640 0*s.* 0*d.*	$8,200
1863, and	–	–	2,477 0 0	12,385
1864, London dung.	–	–	2,369 0 0	11,845
1865,	–	–	2,465 0 0	12,325
1866, Chemical,	434 19 11	2,170	3,330 5 9	16,650
1867, "	529 5 3	2,645	2,423 0 9	12,115
1868, "	1,473 6 9	7,365	4,726 0 8	23,630
1869, "	1,282 3 5	6,410	3,742 0 0	18,710
1870, "	1,551 16 11	7,755	5,232 7 4	26,160
1871, "	1,254 16 5	6,270	4,625 14 11	23,125
1872, "	1,022 7 6	5,110	4,743 11 10	23,715
1873, "	1,353 0 10	6,765	4,570 4 10	22,850
1874, "	950 15 6	4,750	4,628 0 0	23,140
1875,* "	–	–	4,630 19 6	23,150

* Value not yet known.

I think a careful examination of what appears here, and I know of no contradictory evidence elsewhere, will satisfy any candid mind, that the use of chemical fertilizers need not necessarily be destructive to land.

After this presentation of our experiment, it may be useful to consider each element of our fertilizer separately, and applying such knowledge as we possess, indicate the manner in which they are supposed to have acted in the soil.

Sulphate of ammonia.* When first applied, it remained inert until it became dissolved either by the moisture of the soil or by rains; as soon as dissolved, the soil commenced to act upon it, separating it into its component parts, sulphuric acid and ammonia. The ammonia became somewhat fixed within the soil, for most soils have some retaining power over ammonia, and even on highly-farmed land, but a third escapes with the drainage. The sulphuric acid, after its separation from the ammonia, passed downward with the water, and probably in combination with lime passed into the subsoil.

It is a curious fact that, although ammonia is largely retained by the soil, thus furnishing a supply of nitrogen for the growing crop, yet if the nitrogen be supplied in the form of nitric acid, this passes readily through the soil, and escapes. Thus, if nitrate of soda be applied in solution to a soil, both the acid and the base penetrate the soil, and pass downward with the water of filtration. If nitrate of potash be in like manner applied, the potash is in large measure retained, but the nitrogen pursues its path downward with the water. We thus see, that when nitrogen is supplied to the soil through an acid, rather than a base, the progress downward with the water is free, and consequently it can be in a position to afford nutriment to the plant for but comparatively a short time. Nitric acid may, however, be retained longer in some soils than others; but in a light soil, such as ours, theory bids us avoid nitrogen in the form of an acid, and seek it in the form of a base. Hence the sulphate of ammonia is the preferable source of supply over nitrate of soda.

* Sulphate of ammonia is not entirely retained by soils, but only largely: nitrate of soda but little. Under conditions as they occur in England, chemical nitrogen is disposed of as follows: One-third to the crop, one-third remains inert in soil, and one-third is lost through drainage.

In muriate of potash, we are applying not only chlorine and potash, two essential constituents of plant-growth, but also variable quantities of soda, magnesia and lime. In like manner with the sulphate of ammonia, the separation of acid and base takes place here, and the potash is retained in the soil to almost a complete extent, while the muriatic acid passes readily downward with the water. Hence, whatever potash is left over from this year's crop is available for the uses of vegetation another year. In applying kainit, we calculated, therefore, for the potash to be carried within reach of the growing roots, before becoming entirely fixed by the soil, and it is probable that we were also greatly aided here by the moist season encouraging root-growth nearer the surface than ordinary.

In sulphate of potash we have similar actions, as above referred to, but in our phosphoric acid we have an instance of an acid being retained by the soil: so completely does the soil retain this material, that even in soils containing soluble phosphoric acid in great abundance, but the faintest traces even appear in the waters of drainage. Hence, once applied, it remains in the soil until removed by crops or vegetation. Superphosphate of lime may be applied at a greater depth from the surface, than in our case, with advantage.

In a few words let me call attention, in concluding, to a few lessons learned from this experiment of ours, although some of this information has been merely hinted at in the preceding pages.

First, the importance of the proper variety of seed. If possible, seed of a variety which under high culture will bear two ears to the stalk should be selected. This is a most essential point for a large crop. Then the variety should be a small-foddered one. In a heavy-foddered crop, there is a certain loss, as the fertility removed is of far more value in the form of grain, than in the form of stover.

Second, the importance of a correct system of planting. The essential here is to place the hills as near together as the habit of growth of the variety used, will allow; and to leave as many stalks in the hill as is possible. A field which will mature ears on each stalk, six to a hill, will about double the yield over the same or a similar field with three stalks.

THE CULTURE OF THE APPLE.

MIDDLESEX SOUTH.

From an Essay by Abel F. Stevens.

There are certain things that are requisite, in the successful cultivation of the apple, in order to secure the best results. We shall briefly notice them under soils, situation, shelter, pruning and management of trees, and the selection of varieties. The soil and location selected must be such as will be adapted to the growth of the tree and the production of fruit. We regard a good, rich, mellow loam, on a strong, clayey subsoil, the very best for an apple-orchard; on such soils we find the greatest and most enduring vigor and fertility, the healthiest and hardiest trees, and the finest and best-flavored fruits. Apples grown on a clayey soil keep better and longer than those grown on light soils. If the location can be had on the south-eastern or south-western slope of a hill, so much the better. If the site chosen for the orchard is not protected naturally, then a good belt of hardy evergreen trees—the Norway spruce or white pine, set out in hedge-form—will make an excellent protection.

We consider the matter of shelter and protection of the greatest importance. Its necessities are twofold: to guard against excessive aridity during summer, and severe cold during winter; in other words, to modify the debilitating effects of the injurious evaporation produced by the extremes of heat and cold. Our natural forests are rapidly being destroyed, and their destruction tends to lessen the moisture both of the atmosphere and the soil. Thus we must protect our fruit-gardens from both extremes, *for perfect maturity of growth is the great object of all cultivation.* This very important *fact* should always be uppermost in the mind of the fruit-grower,—cultivation and pruning of the tree.

Having chosen our location, we are ready for transplanting the trees. In our latitude, the spring is preferable, owing to the trying winds of fall and winter. The trees should be three to five years from the bud, of good vigorous growth, well-ripened wood, straight stems, medium to low-headed; a good thrifty top indicates good roots. Such trees should be selected for the orchard. Before planting, prune out all superfluous shoots of slender growth in the head, leaving three or four main branches to form a head; let in the light and air for the perfection of growth; the top must be in proportion to the roots; if there is a loss of many roots, cut back the tops so as to secure a proper balance between the two; the ends of all roots must be cut off smoothly, so as to heal sooner and throw out young fibres,—the life of the new tree. Always secure the most roots possible on the trees you purchase, and in the best order, for on these depend the life and aftergrowth of the trees.

As to the arrangement of the trees, the best form is a square, the right distance thirty feet apart, the rows being straight each way. After thoroughly ploughing and marking out the lot, dig the holes large enough to receive all the roots, the subsoil to be loosened up. Some surface-soil having been thrown into the holes, have the tree about as deep as it is set in the nursery, place around the roots carefully the rich soil, but no rank manure whatever should be allowed near the roots, but firmly place the loam around all the little roots, gently shaking the tree, then fill up and tread down firmly. If the roots are still wet, as they should be, no water should be turned on the tree after transplanting. To keep the ground moist, put a good *mulch* of straw, old hay, etc., all over the surface, or stir the surface of the soil by frequent cultivating or hoeing, for there is no *better preventive of drought than constant and deep cultivation of the surface*. The trees will require more or less pruning during their growth; let the heads be shaped right while young, by being kept open, removing all weak-growing shoots so as to give vigor to the tree. While young, the only instrument required will be the pruning-knife. Always cut clean and smooth, that the wound may heal soon. From the seedling tree, through all

stages of growth to maturity, pruning, to some extent and for some purposes, is necessary.

Pruning is one of the most important operations connected with the management of trees: it is a surgical operation and should be performed with care and judgment. The advice of many is, prune "*at any time or place.*" To this slovenly, injudicious and outrageous advice, we say *no*, *most emphatically* NO; to prune intelligently requires a knowledge of the structure of the tree.

The season of pruning is very important, as the true theory is based on the condition of the sap. For the removal of large limbs from the trees, the best time is just *after the fall of the leaves in November*, for it is the proper time as regards the science of life, health and action in the trees. There is no thin sap, the very life-blood of the tree, to flow out now, but the coursing sap has been elaborated by the leaves during July, August and September, and returned directly under the bark to form alburnum or sap-wood, which annually increases the diameter of the branches. The objects of pruning are threefold; viz., *form*, *vigor* and *fruitfulness*.

First, the *form*. We consider the best shape for our apple-trees is the "round head" or "umbrella" shape, not only for symmetry, but for the free circulation of the air and light, and the convenient gathering of the fruit; this form also is self-protecting, as it shades the trunk from the sun in summer and breaks the wind in winter. Pruning for vigor: We should ever remember that the leaves are the lungs of the tree, that vitalize the sap; and if the branches and roots are in due ratio to each other, a loss of them must impair the vitality. In removing side branches or suckers—they are rightly named, as they suck the life-sap from the tree, and divert the sap from its proper functions in promoting vigor and fruitfulness, —we give new vigor and stimulate the growth. Pruning to induce fruitfulness is less understood and less practised than the other two methods; the principle is just the reverse of that upon which we prune for vigor. It is the Banting system applied to vegetation. A very fat animal is proverbially a poor breeder; so an overluxuriant tree is a poor bearer; we must check this wisely, or injury will follow; "*pinching*"

back the most rampant growing shoots will check the free circulation of the sap, and thus promote fruitfulness. Root-pruning is a very effectual method, yet its permanent effects on the life and vigor of the tree are somewhat questionable. Two *maxims* are to be observed in *pruning:* first, never prune while the sap is thin, as it will injure the tree; second, always cut close and clean, and cover large wounds with wax or gum-shellac dissolved in alcohol.

Yet, no matter how scientifically we study to prune or form the top, if we neglect the *roots*, our trees fail; a vigorous growing tree is a rank feeder on the soil; therefore we must furnish it with the requisite elements of food; all growth of grass or grain must be stopped around young growing fruit-trees. The soil may be looked upon as the laboratory of nature, where her great decomposing agencies, air and water, prepare the food for plants, and the object of culture is to facilitate the chemical operations. Experience shows that frequent stirring of the surface stratum of the soil, thus allowing the air and moisture to penetrate to the growing roots, is the most essential item in cultivation. An annual dressing of ashes or bone-dust spread on as far as the limbs extend, and *forked* under, will greatly assist the growth. All the rough bark should be carefully scraped off, and in early spring a solution of soft-soap, or better still, whale-oil soap (and if inclined to be mossy, dissolve a pound of potash in water), applied to the limbs and trunks, which will rid them of all insects' eggs that harbor there. Borers can be killed by a sharp wire: follow up in the holes made by them; be sure and keep off the caterpillars, web-worms, etc.

A very important question is, What varieties shall we grow? As it costs no more to have the best than the poorest sorts, be careful to select the very best, and those that are adapted to your locality. Old Massachusetts is eminently the home of the apple! And in no place, from the State that first greets the rising sun on the east, to the golden slope of the Pacific Coast, does better flavored fruit grow than in our own State. Had not our soil been congenial to the apple, how could we have produced such varieties as the Porter, Hubbardston, Williams, Baldwin, Pippin, Russet, etc.? And all but two

of these originated in Middlesex County, the Roxbury Russet in Norfolk, and the Hubbardston in Worcester County. Here is a fact worthy of note: that these varieties, that are so popular in all the New England States, are the very leading sorts throughout the far West, where millions of bushels are grown every year. For a list of twelve sorts extending through the seasons of summer, fall and winter, we would recommend for summer, Red Astrachan, Williams, Sweet Bough and Golden Sweet; for fall, Gravenstein, Porter, Pippin and Hubbardston; for winter, Rhode Island Greening, Baldwin, Roxbury Russet and Tolman's Sweet. We might extend this list, but we believe that the above covers all that are worthy of growing for the market or home use. There are several varieties of crab-apples that are very profitable to grow.

For the local market very early sorts are the best, but for a distant market late sorts command the most remunerative prices. Large, handsome red sorts sell more readily than light-colored ones, which show the slightest bruise. For home use the highest flavored should be chosen. As a rule, early apples seldom retain long their flavor or beauty after being picked. A word about keeping apples: they will keep better if picked a little before they ripen, so as to fall from the stem in autumn, and they should be kept in as cool a temperature as possible, just above freezing-point, and subject to a little variation. They will thus retain their flavor and form. Immediately after gathering, spread in a dry, cool apartment, with a free circulation of air. They should not be covered up or headed up tight in boxes or barrels for two or three weeks after being gathered, as they must sweat or throw off their natural moisture to keep well.

Fruit-culture, whether considered as a branch of profitable industry, or as exercising a most beneficial influence upon the health, habits and tastes of the people, becomes a great national interest; and whatever may assist in making it better understood, more interesting and better adapted to the various wants and circumstances of the community, cannot fail to promote the public good. And at the very head of fruits stands the apple. When we consider its value as an article of food,

its commercial worth, its adaptation to varied climes and soils, we are unable to account for the comparative apathy of our people in not growing more of the vast quantities of this fruit that are used in our State, and thus save the millions of dollars that are paid out of this State annually for apples grown in the Middle and Western States. It is proverbial that the apples of Massachusetts are not equalled in flavor by any grown in the Union. And at the great markets of Boston, of the apples offered for sale, the "fairest and the best" are grown in Middlesex County. This county has ever borne the banner for her fine fruit.

In coming years may the hillsides of this county be adorned with young, vigorous, fruitful orchards, and we again have this standard fruit in the same abundance as in its pristine days. To accomplish this we must begin anew, by starting our future orchards with hardy, native seedling-stocks, budded or grafted to the very best hardy new varieties known to the orchardist, and only those that have met the approval of authorities in horticulture. We have much, I think, to expect from the many new and improved varieties; also from choice seedlings that are now being tested, and will soon be given to the public.

FARM IMPROVEMENTS.

ESSEX.

From the Report of the Committee.

Improving Swamp-Lands.—The members of the Committee met July 5, to view a piece of meadow or swamp-land entered by Mr. Samuel Dane of Hamilton. The piece, containing about six acres in all, is divided by an open ditch into two lots, measuring respectively about four and one-half and one and one-half acres. The land before being improved was a wet, soft muck, ten to fifteen feet deep, about one-half wooded with old maple and pine stumps, the remainder covered with bushes and brambles. It emitted an offensive and miasmatic odor, and was entirely worthless. The main ditch through the piece above spoken of, as well as some other ditches leading into it, were dug before Mr. Dane bought the place; but these ditches were rendered almost useless by obstructions at the outlet, subsequently removed by a change in the adjoining highway.

On the small piece Mr. Dane commenced work in 1869, by cutting down the hassocks and digging cross-ditches to the main drain, at intervals of twenty-five feet. Having thus levelled and drained the surface, he covered it with gravel from the adjoining high lands to the depth of three or four inches and sowed grass-seed. With only this treatment, and no manure of any kind, the crop is stated to have been two tons per acre for each of the last five years. The crop of this year was standing, and was estimated by the Committee to come fully up to this standard. Mr. Dane gives the cost of ditching, levelling, etc., as $25; the cost of gravelling as $45; cost of seed $4; and of cutting and saving the hay as $5 per ton, or $75—a total cost of $149.

A crop of two tons per acre, on one and one-half acres for five years, would be fifteen tons in all, which at twenty-five dollars per ton amounts to, ...	$375 00
Leaving a profit of	226 00

Work on the large piece was commenced in 1870, and has been continued to the present time as opportunity offered. The deep, wet footing, the almost impervious bramble thickets, and the size and toughness of the stumps and buried logs made the task as difficult as could be found anywhere. Ditches were to be dug, bushes and brambles to be cut out and destroyed, hassocks levelled, stumps and tree-trunks to be uncovered, cut to pieces, raised and hauled off, and the piece converted from a worthless jungle to a productive field. This has taken time and money, and is not yet completed—the four and one-half acres being in all stages, from work just begun on one side to the growing crops on the other. Much of the wood and roots had to be burned with the brush, but a good deal has been saved and sold or used.

On the side of the piece first cleared, gravel from the bank near by was carted on to the depth of three or four inches, over the space of about one acre, a small quantity of fish-compost spread and harrowed in, and grass-seed sown. Mr. Dane states the produce of this acre to have fully equalled for the past five years what it was when the Committee saw it, and estimated it to be two and one-half tons of hay, some of the stalks being over five feet in height. Grass-seed has been sown on other parts of the piece, which have been drained, cleared, and levelled, but not gravelled or manured, but the crop is sickly and of small value. Corn and vegetables have also been cultivated, but without much success. The soil of such a place is too sour and cold to grow crops without the application of some amendment.

Mr. Dane gives his outlay and returns on this four and one-half acres as follows:—

Labor of ditching, getting off wood and stumps, grubbing up and gravelling, harrowing, and seeding, . .	$230 00
Cost of seed, ...	9 00
Compost, and labor of applying, ...	8 50
Cutting and harvesting hay, ...	75 00
Total, ...	$322 50

Value of maple wood at $6 per cord,	$200 00
" pine " 3 "	50 00
12½ tons of hay at $25 per ton,	312 50
Total,	$562 50
Net profit,	$240 00
Total net profit on the six acres,	466 00

The Committee saw enough to enable them to judge that the crops were not overestimated; but for the amount of work which must have been done they think Mr. Dane's estimate of cost is too low. Mr. Dane kept no account at the time, not expecting to enter his land for premium, and he depends much on memory for the details. He states, however, that a large part of the labor was done in the winter, and at very cheap rates. But the excess of profit shown by the above statement is large enough to cover a much higher estimate of cost, and even if we should allow the expenses to be as great as the return, which cannot possibly be the case, the increased value of the land, and the removal of the former offensive and unwholesome exhalations are sufficient to make the work remunerative.

The Committee, however, cannot withhold their belief that open ditches, such as Mr. Dane has dug, are the poorest way of draining wet lands. They soon become obstructed by the caving in of the soil and the accumulation of vegetable matter, so as to prevent the free passage of the water, and the work has to be done over again, or the land and crops relapse into the poor and valueless condition from which they were temporarily reclaimed. Good, permanent work is almost always the cheapest in the end, and a drain of tile or stones properly laid will far outlast the open ditches, be more effective, allow the passage of teams, make cultivation easier, and be finally the most economical.

Already parts of the ditches on this meadow are so choked as to be unequal to the work they ought to do, and in such places the cultivated grass is giving way to the coarse and reedy herbage natural to wet localities. Still, so far as it has been completed, the Committee judge Mr. Dane's experiment

in great measure a success, and an encouragement and example to others in the county who possess such lands.

HENRY SALTONSTALL, *Chairman.*

UNDERDRAINING LAND.

ESSEX.

From the Report of the Committee.

The Committee take pleasure in calling attention to the annexed statement of Mr. Gregory, and they suggest that the farmers of the county might learn much, by a visit to his farm, which cannot readily be put into this statement. Although the work of underdraining is necessarily buried, still its effects are plainly visible on the surface, and must be seen to be fully appreciated.

The Committee visited Mr. Gregory's farm on the 11th of October, after heavy rains, when they found the low mucklands so well drained, that they were in good condition for any treatment—some of this land, with crops of cabbages still standing, and other parts covered with lately-pulled onions left to be dried, where, probably, without drainage, they would have been flooded.

As will be seen by his statement, Mr. Gregory did not enter a single piece of land of uniform character, but the entire tillage-land on the farm, which comprises nearly every variety of soil, the most of which he has underdrained with nearly equal benefit to all.

Underdraining may be classified as follows:—

1. Thorough drainage.
2. Partial drainage.
3. Sufficient drainage.

The first, as the word implies, affects equally every part of the land,—has no open ditches, and but one "outlet." It usually requires the services of an engineer, and is a very nice and somewhat expensive piece of work,—as, for instance,

a large field of clay land, whether lying low or not, and without regard to its condition as to wetness from springs, may be more profitably treated by thorough drainage than by any other system. The rule usually prescribed for this kind of drainage is, tile laid not more than thirty-three feet apart, and as nearly three feet deep as the nature of the ground and the drop of the outlet will admit. Its cost, at prices of labor since the war, is not far from $100 per acre.

2. "Partial drainage" is such as only partly or imperfectly secures the object aimed at, although it often does much good, as when one drain is placed through the middle of a piece of land, leaving parts on either side that may be full of springs —or where no sufficient fall can be had to secure a proper outlet. This kind is to be tolerated only when the exigencies of the case permit of nothing better.

3. "Sufficient drainage" may be described as that which completely secures the object without any unnecessary expense. For example: a field of sandy loam, upon a subsoil of gravel, would ordinarily be considered as sufficiently drained by nature, and yet it may be kept too wet by a spring of water in its higher part. To tap this spring, and draw its water in the most direct line to the nearest available outlet, would be sufficient. Sufficient drainage is the kind which Mr. Gregory has applied, with admirable judgment and complete success.

As for the kind of tile to be used, the Committee are of opinion that round tiles, with collars, are preferable to those used by Mr. Gregory. The first cost of these tiles is but little more, and much less expense for labor and materials is required to fix them in place and hold them in line. The collars serve the double purpose of holding the joints immovably in line and protecting them against the passage of sand or other matter. These points are of the greatest importance in work which is to be buried from sight, and which is intended to endure for many years.

D. F. Appleton, *Chairman.*

Statement of J. J. H. Gregory.

The underdrained land I enter is located on the Glover Farm, Marblehead, near the junction of the roads to Salem and Lynn. The portions drained embrace several tracts; viz., gravelly loam, underlaid by hardpan; muck meadow, underlaid by clay; and a strong clay soil, increasing in stiffness, until, at a depth of about three feet, a good brick clay is reached. An open ditch runs through the middle of the farm, and the various drains open into this. The draining has been done almost wholly by tile, a part the horseshoe, but mostly the sole tile, as those having a bottom are called; these having been laid at depths from the surface varying from three to four feet. In draining the gravelly portion near the barn, I began about three hundred feet above the lowest place, opening my drains about thirty-two feet apart, and laying two-inch tile, which emptied at right angles into five-inch, the latter into the main ditch; with this one exception, all the tile opened directly into the main ditch. The entire length of tile laid was about four miles.

Following directions given by theoretical writers, who drain more on paper than on soil, I procured a lot of English draining implements, which proved utterly worthless in our hardpan, however well they might be made to work in the clays of England. I found one of the greatest wastes of labor, which greatly augmented the cost, in the habit my men had acquired of digging wide ditches. The ditches having been excavated at the required depth, a half of a hard brick was firmly set where the ditch ended, and against this one end of the tile was closely set to prevent the soil working in with the water. The tile (those well baked having been carefully selected) were placed end to end, as closely fitted as possible, until the open ditch was reached. Small stones were firmly wedged between each side of each tile, and the side of the ditch, to keep them in line, and a forkful of eel-grass, which is almost indestructible, dropped over each joint. When the quantity of water to be carried off was very large, small stones, to the depth of three or four inches, were carefully placed over the tile, and these were covered with eel-grass. The soil was put

on with great care to prevent any breaking of the tile, and so consequently destroying the drain. In putting on this first layer of soil, I had a man stand in the ditch, and taking the earth from the sides, carefully place it. On the muck-meadow, where the bottom of the ditch did not reach the clay, I laid hemlock boards about six inches in width.

The ditches on the clay soil were dug to a depth of over three feet. I am satisfied that this was a mistake, and if they had been dug to a depth of two feet and a half, and been put as near again together, they really would have been more satisfactory. In reclaiming some of the tracts, I found that ditches conveying the water from the springs which drained them directly into the main open ditch were all that was necessary. Some acres of muck-meadow were by this means drained sufficiently dry without the systematic placing of tiles every two rods. In one instance where a ditch came near a wall where plenty of small, loose stones had accumulated in the course of many years' dumping, I had the experiment tried of using these in place of tile, with reference to determining the comparative cost. The result was decidedly in favor of the tile; the great deal of handling of the stone made necessary in collecting them and selecting the smaller ones for the water-course, and the slow care necessary in placing and covering these, required extra time, the value was far more than an offset for the cost of the tile.

The general result of this extensive tile-draining has been to bring under successful cultivation many acres that had never before been cultivated, and to so drain drowned areas of their superfluous water that some of the best tillage-land now on the farm embraces tracts that previously could not be relied upon for a crop oftener than one year in two. To sum up briefly the whole matter, it brought into excellent tillage condition a farm previously notoriously wet and cold. I close with a suggestion to my brother farmers: don't expect too much from your underdraining the first one or two years; it will take that time for most of the water in the saturated earth to find routes to the tile, and so complete the underground system of drainage.

FRUIT-CULTURE.

ESSEX.

From the Report of the Committee.

The apple has of late years received much abuse among us, and the planting and care of apple-trees has been ridiculed by those even who would be our teachers.

Even the subject of the "permanent decline of the apple orchards of New England" has been suggested by the highest authority, and it becomes us all (all at least who intend to raise our own apples, and follow it as a profitable business) to look into those things and see if they are really so.

Our own opinion is simply this: that there is a "permanent decline" in many and most of the apple-orchards in this part of New England, and that it arises from sheer neglect or an undue zeal in the wrong direction. Who that has travelled through any of the towns in this county, during the last summer, has not noticed with sadness and humiliation the effects of the tent caterpillar, or seen the trees "burnt as with fire" by the persistent canker-worm, thus marring the beauty of our otherwise beautiful scenery? Can trees in such a condition be reasonably expected to bear regular crops of good marketable fruit? Or, if left wholly to the ravages of these and other insects for five, ten or fifteen years, is it a wonder that many of our orchards should show symptoms of a "permanent decline"?

We notice in the "Transactions of the Massachusetts Horticultural Society" for 1874, that the subject of "legislative enactments to prevent the multiplication of injurious insects in neglected orchards" was fully discussed, and a bill to that effect strongly urged by some of the members. In fact, such a bill was presented some six years ago to the agricultural

committee of the legislature, but for some unexplained reason was never reported. Your Committee, in behalf of the Essex Society, would go heart and hand for such a law, provided it could be passed and carried into successful operation.

At present, in lieu of such a law by the legislature, your Committee cannot too strongly urge upon farmers and fruit-growers everywhere, to cut down old and neglected apple-trees, not only in pastures and by road-sides, but in fields and gardens; those that your good judgment and common-sense would lead you to think are past recovery or not worth protecting, we would say, emphatically, *cut down*. The same would apply to the wild cherry-tree, which is a pest and a nuisance everywhere. Those of our apple-trees which are worth anything, we would say *protect* and cultivate as any other farm crop, which treatment we have found, both by observation and experience, will recover the trees, causing them to make a strong, vigorous growth, and bear abundant crops of fruit, thus in themselves ridiculing the idea of a "permanent decline."

This society has for several years past offered very liberal premiums for the "best-conducted experiment for preventing the ravages of the canker-worm," and although experiments have been made and patents applied for, and in one or two instances premiums awarded, we regret to say that in many sections of this county the canker-worms still have it pretty much their own way. Probably, if carefully attended, these new-fashioned troughs for oil or coal tar would be effectual; but how often do we see them neglected for a whole season! How often do we see the oil overflowing or oozing out and covering a large portion of the trunk below, thus injuring the tree as much as do the worms themselves! These troughs are expensive, and ought to be attended to when applied, and for a few trees, in garden or orchard, are probably the best thing; but we believe the whole thing to be a failure, and that the old method of applying printers' ink is still the best. One member of your Committee protects a thousand trees every year with this "grub ink" so effectually, that only worms enough are left to keep the seed good, and at an expense, reckoning both labor and material, of only about four cents to a tree annually. This protection would be still

more effectual were it not that many of the orchards in the immediate neighborhood are not protected at all.

The best method is to commence in good season in the fall, about October first, and tack narrow strips of tarred paper, some five or six inches wide, tightly around the tree, just below the limbs; upon this apply the ink (when warm, in the middle of the day,), a good coat at first, afterwards a mere touching will answer; apply once or twice a week till cold weather sets in, and should there be a long-continued warm spell in winter, an application or two might be well. Commence in the spring as soon as the frost is out four or five inches, and continue as long as the grubs run, generally about a month. Remove the bandages every spring. Procure a good article, and follow it up carefully for one or two years, and very few worms will be left.

For destroying the caterpillars, commence when they are quite small; take them when they are at home, generally early in the morning, or by ten or eleven o'clock in the forenoon. The "handiest" way to kill them is the best, though a stiff, conical brush attached to a pole, is very convenient. If all would take hold in earnest, these pests might easily be got rid of, as they are much more controllable than the canker-worm. The apple-tree borer is troublesome at times, but can easily be destroyed. The curculio appears at times, as though determined to destroy all our fruit; but one thing is certain, they are not more plenty than they were twenty years ago, and with the destruction of our plums and many of our sweet cherries, they appear to be partially satisfied, and with nothing left but the apple and pear to prey upon, they will probably diminish, rather than increase.

T. C. Thurlow, *Chairman.*

FRUITS.

ESSEX.

From the Report of the Committee on Grapes.

Looking back upon the record of our society, as published, in the reports of committees on fruit, we find, year after year, premiums and gratuities awarded for choice fruit that was a gratification to those interested, and a pleasing sight to the looker-on at the hall. But what lasting information to the society was gained by it? None. If Mr. A. had better fruit than Mr. B., and Mr. C. had unhealthy and unproductive trees and vines, so that he could not exhibit at all, how was he to get information to help him unless he visited or wrote to Mr. A. to know how he did it, which he would not be likely to get in as good a way as from the report of a committee who pass judgment on the merits of the fruits exhibited, and who are entitled by the rules of our society to receive such information, and which, if not furnished, they should seek after for their own information and the information of hundreds and thousands who read the annual report of the society's doings, many of whom are unable to attend the exhibition.

Feeling such a lack of information on a subject which deeply interests a great many, and finding myself, much to my surprise, from my imperfect knowledge of the subject, Chairman of this Committee, I felt that this year, at least, the Committee ought to take a new departure from the old rut, and therefore, to do it, called upon the principal exhibitors to put their shoulders to the wheels and help them out by answering the following questions: How were your vines started,—by single eye, cuttings or layers? How old are they? How old were they when planted? What was the soil? How enriched since planting, and when? What exposure have

your vines? How trained? How trimmed, and when? Do your grapes ripen well every year? How many vines have you, and the kinds? What kinds do you recommend as best adapted for Essex County soil, freest of disease and surest of ripening?

How many peach-trees have you, and the kinds? How old are they? How old when set out for bearing? What was your soil? How and when enriched since planting? How trimmed? What kinds do you recommend for cultivation in Essex County for eating?—for preserving?

Have your grape-vines or peach-trees had any disease? If so, what have you done for it, and the effect? Give any other information relating to grapes or peaches and their culture, that you think might benefit our society.

The response has been such that it has taken us out of the old rut, with a good push ahead, and will be found in the shape of statements appended to this report, which to myself have proved interesting and instructive, and I feel assured that they will prove so to others. They are submitted without criticism or recommendation, for all interested to read carefully and then form their own judgment of what is best to plant and how to cultivate it, from the actual experience of those right about them, ever remembering that no one is too old to plant seed with the expectation of eating the fruit. I have in mind Mrs. Riggs, residing not far from me, who, when eighty-eight years of age, planted two peach-stones from the fruit of the same tree, which made two trees, on one of which the fruit is smaller and a fortnight earlier than the other. Both have been in bearing three years. The first year in bearing she sold a half-peck for eighty-seven cents, and this fall, being ninety-five years of age, and smart at that, after supplying her own family, sold a half-bushel of nice peaches from the trees.

David W. Low, *Chairman.*

Statement of T. C. Thurlow, West Newbury.

We have been in the business of raising vines, etc., for many years; have generally started our grape-vines from two or three eye cuttings, wholly in open ground without

glass; have sometimes layered vines, but think one way about as good as the other, though it is much the quickest and cheapest way to grow vines from a one or two eye cutting. I should recommend planting them when two or three years old. I should always prefer a light, dry soil for the grape, with a south or south-east exposure, and should never manure the soil with any animal manure, but with potash in the shape of dry wood ashes or dissolved potash, lime, bone-dust, etc. For vineyard planting I should prefer two stakes of cedar, or some other durable wood, set say three feet apart, and the vine planted between them and trained around both. I should always trim in the fall, during pleasant weather, just after the fall of the leaf.

We have not many bearing vines now, as the past two or three seasons have not been favorable to their ripening. Grapes to ripen well in this vicinity require a dry, warm season, without frost till very late. I do not think the climate here as good to ripen grapes in as it is farther west in the same latitude, say in New York or northern Ohio. For my own planting I should prefer our very best natives, as Concord, Hartford Prolific, etc. Those that have foreign blood in them, as the Rogers' Hybrids and a host of others, may do well for a few years, but are short-lived at the best; this has been my experience. We all hope for a good native early grape, say two or three weeks earlier than the Concord and of as good quality as that variety, but we have not found it yet. Of course these remarks apply wholly to out-door cultivation, without any protection or glass.

I should recommend for this county the Concord, Hartford Prolific, Clinton and Isabella in very warm, protected localities; the same for Diana, Delaware, Adirondack, etc. We hope something from the new varieties, as Cambridge, Croton, Moore's Early, and some of Bull's new seedlings; but my own experience with all the Rogers', Eumelan, Delaware, Rebecca, Allen's Hybrid, Iona, Israella, Crevelling, etc., has not been such as would warrant me in recommending them for general cultivation in Essex County.

I believe we can raise peaches in this county as well as ever, unless something unforeseen should happen to the trees, for they now look perfectly healthy, at least in this vicinity,

except where they were killed at the roots last winter as they were in very many instances where the roots were not protected as they should be. I have some two hundred peach-trees planted three to five years which look well considering that they were planted on a northern hillside in a very unfavorable location. Quite a number were killed in the root last winter, which gives them a sickly, dying look which some people would take for the "yellows," but that is a disease I have not seen at all for several years. These bore pretty well this season, some of the trees bearing one-half to one bushel each.

Last spring we planted five hundred and fifty peach-trees in a good location, on a southerly hillside, the soil a good sandy loam. No manure of any kind has been, or will be, applied except a good handful of wood ashes to each tree. They look splendidly, and I never saw a better lot. I should recommend for this county Early Crawford, Large Red Rareripe, Coolidge's Favorite, Old Mixon Freestone, Mountain Rose, Hale's Early, where it does not rot, and that would be on high, dry soil, where it would be good and the most hardy and productive peach of the whole lot; also Stump the World, Late Crawford, George 4th, Yellow Rareripe, etc., the varieties preferred in the order named.

I should set peach-trees at one year from the bud in early spring, for orchard planting, say sixteen or eighteen feet apart, or on very good land twenty feet, and should trim at any time in summer when young, but when old and in bearing, just after the fruit has set in the spring. I have not for several years seen any "yellows" or borers in any of our peach-trees. The "curl of the leaf" I think is caused by climatic influence, as it occurs nearly every spring. We should be happy to have you or any one interested see our place, and think you would be pleased with our peach orchard. We have a nursery of twelve thousand peaches budded this season.

Statement of Joseph W. Ropes, Danvers.

I have been engaged in the cultivation of the grape about thirteen years, commencing with small vines purchased at different nurseries, some of which were probably raised from unripe cuttings, requiring several years of careful nursing

before getting a return from them. I think the surest and quickest way to obtain strong and healthy vines is to raise them from layers. If I were to select six varieties for garden culture, it would be as follows: Delaware, Iona, Black Hawk, Massasoit, Hartford, and Martha. I mention the Black Hawk instead of the Concord, as it possesses all the good qualities of the latter, and is at least ten days earlier in ripening. I should have added the Crevelling instead of the Martha, but as most cultivators like the different colors, I substitute this as the only white grape I have yet succeeded in obtaining an average crop of, but the Iona is my favorite for a table grape,—sugary, rich, vinous and spicy, with a melting tenderness, and ripening evenly from the centre. With me it is a healthy and vigorous grower, the bunches and berries large and well shouldered, and were it two weeks earlier in ripening I should place it in the front rank for general cultivation. I always succeed in ripening them, as during the early frosts they may be protected by throwing over them a light mat.

My vines have not been troubled with disease except that in an occasional wet season they have suffered some from mildew, but the greatest drawback to the cultivation of the grape I find to be the depredation of the robins. They always know where to find the best grapes. My system of training is by what is called the Fuller plan, with horizontal arms from four to six feet each way, allowing the canes to reach the top of the trellis, which is five feet in height. I prune back in the fall to two buds, with the exception of those of a rank growth, which I prefer to prune on the renewal system. My land is light with a gravelly subsoil. I use no manure except ashes, but in planting always place a quantity of bones around the roots. The soil for grape-vines should not be enriched with animal manure, although some vines, like the Delaware, seem to thrive in a rich soil, but I think they soon deteriorate. Most of my vines have a southerly aspect, some a westerly. I can perceive no difference. I have raised hundreds of seedlings but as yet have not found one better than those already in the market. I have recommended a few vines for garden culture only, for I think that all having room for them should have at least that number. My experience in the cultivation

of the grape has convinced me that it cannot be made a profitable business for the farmers of Essex County.

Statement of Franklin Upton, Danvers.

Grapes can be raised as easily as pears, apples or plums, and much more easily than currants, and I know of no reason why they should not be more generally cultivated. In cities, where the gardens are more compact, how easy to add the ornamental to the useful by training more or less vines to the fences or on the walls of the buildings. The grape is a favorite fruit, and why not have it more plentiful when it can be successfully and easily fruited?

After an experience of eleven years, I am willing to give what information I possess, and will most cheerfully comply with your request and answer your questions to the best of my ability.

Commencing my grapery with half a dozen vines, two years old, I soon increased to one hundred and twenty-five vines, mostly by layers which make the most rapid growth, bearing on the third year of planting. My soil is a light rich loam, with a fine gravelly subsoil. In the spring I top-dress with ashes. A large part of my vines face the south. I trim and train by Fuller's system of horizontal arms to the right and left, on wires five feet high, the vines fruiting eighteen to twenty-four inches from the ground. Every fall, as soon as the leaves are off, I prune to three buds for the winter and allow only two of these to push in the spring.

I have ripened my grapes every year, with some exceptions of particular varieties, which lost their foliage by mildew and disease of the leaf. I can successfully contend against mildew by the free use of sulphur applied to the vine. The rose-bugs have been the greatest enemy to contend with, as they had to be picked from the vines. I have thirty-three varieties of grapes, including two seedlings. The six best with me are the Iona, Delaware, Eumelan, Crevelling, Israella and Massasoit. For the best dozen I would add Croton, Adirondack, Walter, Brant, Agawam and the Rebecca. The fruit of the Rebecca is very handsome, and when fully ripe is of good character. The vine should be near some high fence, or in a

well-sheltered position, and requires winter protection. I have in my garden now one hundred and twenty vines, and this season I have fruited one hundred and ten of them. All vines do much better if they are laid down and covered with earth, for our cold winter is destructive to tender varieties.

My garden has eight apple, four plum, twenty-three pear and forty-nine peach trees, with one quince and thirty currant bushes, and plenty of room left for flowers, shrubs, etc., on half an acre, including what my house and barn occupy.

You will bear witness that at our recent exhibition we had a very fine show of fruit, grapes and peaches being uncommonly good, and there were two plates of plums that attracted much attention. Some years ago this fine and delicious fruit grew most abundantly, but of late years it has been almost impossible to ripen it, principally on account of the depredations of the curculio. To rid the tree of this pest requires both patience and perseverance. Perseverance, by rising with the sun and spreading beneath the tree a large piece of white cloth, and then by a sudden jar of the tree the curculio, or little Turk, as he is called by some, will fall, apparently lifeless, upon the cloth, and can be easily killed. Patience, by repeating this operation three or four weeks in succession, commencing as soon as the fruit is set. In this manner I have succeeded in fruiting my trees several years in succession. Another and a more formidable enemy is the black wart. I know of no sure way to stop its spreading, although I am trying several remedies recommended. Could some sure remedy be suggested for this, I know of no reason why plums could not be as plentiful as they were years ago. I have recently added to my collection a few trees of the "Wild Goose Plum," which is said to resist all attacks of the curculio; if so, it will prove a valuable acquisition. Light and well-drained soil is best adapted for the plum.

Statement of Thomas Capers, Newburyport.

As regards peaches, we have a very favorable place for a few trees, being sheltered from the north and north-west. We have in all twelve trees, some of which are over twenty

years old. I find the best way is to plant but one or two every year to keep up the stock.

Our trees suffer more from overcropping and September gales than from any disease. We have lost several large trees within a few years from that cause. Trees one year from the bud are better for transplanting than larger ones. Light, sandy or gravelly soil is better than damp, heavy soil, as the trees do not make so much growth, and the wood ripens better and produces more fruit-buds. Prune away half their growth every spring.

I have not manured the trees at all since they were planted. The Susquehanna, exhibited at the fair, is planted in a narrow flower-bed about eighteen inches wide, with a gravel walk ten feet in width by the side of it, so that it is nearly all gravel. I planted the Susquehanna and Hale's Early in 1869. Up to this year the former has been a very shy bearer; this year it had a full crop. Hale's Early has fruited well every year since planted, and only one year did the rot, which is common to that variety, affect them.

I should recommend Hale's Early, Early Crawford, Stump the World, Early York, Yellow Rareripe and Susquehanna as best for Essex County. There may be others, but those I have proved to be first-class.

The seedling exhibited (Essex County) was raised from stones sent from South America five years ago. I have two others, but they are not so good in size or quality. The Early Crawfords which I exhibited were planted in 1872, then one year from the bud. Some specimens I measured were nine and three-fourths inches in circumference.

Of grape-vines we have about a dozen, comprising Hartford Prolific, Concord, Adirondack, Diana and Isabella. The Hartford I consider the best early grape, but the Concord is best for general cultivation. I have two vines of Concord which are trained on a trellis over a steep bank, facing the south-west, which a great many gardeners think is different from all others they have tasted, but I believe it is owing to its favorable situation, which ripens them better. The Diana is a favorite variety with me, but it is rather late. My grape-vines are raised from layers, spur-pruned in part and part renewal. Last year my grapes were badly diseased, as were

all in this region; this year there is no sign of any. Good drainage and high culture are very essential for grape-vines, and wood ashes are good. I cover the border every fall with six inches or more of manure, and dig it in the spring.

Statement of D. H. Stickney, Groveland.

I wish I could answer your questions in relation to the cultivation of the grape in a manner at all satisfactory to myself, for I have had abundant crops some years and nearly failures in other years with the same treatment—indeed, perhaps I ought not to use the word treatment, for I have never followed any particular method.

I have perhaps one hundred and fifty vines, mostly from layers. They are upon a variety of soils, and were I to give an opinion I should say that my best success had been upon the poorest soil. I am of the opinion that land can be made so rich that you get a monstrous growth of wood at the expense of the fruit. I have noticed that the best fruit has always been found upon vines from two to four years old. I can account for this in no other way than that the top has been allowed to make all the wood that desired to grow, and, as sometimes is the case, the vine will start out with a heavy crop and every prospect of success, till the grape gets about its full size, when it remains and hangs upon the vines until the leaves are all off, and never comes to anything at all. I know of no remedy unless it be to thin or reduce the crop one-half, or even more, and this we are loth to do, for if done at all it must be done in June or July, when we are not sure but the conditions will be favorable for a full crop.

You ask what kinds I recommend. I hardly know what to say, for I have had failures some years of all varieties; still I would not part with any of them. I am quite sure the Concord will perfect its fruit more years in ten than any other variety now known.

I am also well satisfied that a high, dry, sandy soil, or a soil full of cobble-stones is the most desirable for the grape. Such a soil Mr. Gage, of Metheun, has, which enabled him to show a number of kinds of ripe fruit at the New England Show at Manchester, N. H., upon the first of September. I

have to-day many bushels of grapes of full size hanging upon the vines, trying to color, which will be worthless. I think had my soil been similar to the above, I should have had half as much wood, half as full crop, which I think would have matured and been gone two weeks ago, and been of the first quality.

My seedling I hope much from. It is a sure bearer, perfectly hardy, and early enough to avoid frosts. My large Concord grapes were obtained by selecting the most vigorous canes early in the spring, allowing only one bunch of blooms to remain on each, and constantly heading in as fast as wood was inclined to make.

I think this matter of grape-growing is something one must learn by experience, for it is a fact not to be denied, that we are in a section of the country that will produce a crop only once in a while, and this I am not sure should not be called a chance crop.

Statement of George W. Taylor, Peabody.

Although I have not achieved much success, perhaps a recital of my experience may be of some use to those who are about to commence the business of grape-growing. At the start, let me say to any one who expects to make the cultivation of the grape in Essex County a paying business, that it will be a vain attempt, and will end in mortification and disgust.

The grape when fully ripened is truly one of the most luscious of fruits and as such will ever be sought by the public, but it is a lamentable fact that our northern home is *not* the home of the vine. It is where the mild rays of the summer sun love to linger, and the genial breezes of the tropics, with the deep and warm soils incident to the "sunny south." There is its home, and there will it give forth the rich harvests so delightful to man.

If we do succeed here in raising a few of inferior quality, it is only by constant care and toilsome labor. A man would make more money raising potatoes at fifty cents a bushel than grapes at ten cents a pound, which is about as much as one can obtain for first clusters we are able to get into market.

Long before our earliest ones are ripe, our markets are filled with grapes from the South, and the people have had their fill, or at least the time of high prices has passed and ours have to be sold at lower rates. I have been trying to raise grapes for the past twenty years, and have not as yet produced anything very satisfactory. Either my berries or bunches are small, or, if I highly manure the ground, the vines make such rampant growth that the wood ripens poorly, and the grapes seldom become fit for use.

In starting the vines, I have used single eyes, cuttings, and also layers. I have never had much trouble with either method, but think that I should prefer layers of one year's growth to either of the other methods. In my experience I have found that a good strong one-year-old vine is the best to set, surest to grow, and is at just the right age to train in any manner preferred by the cultivator. Some of my vines are twenty years old, and others have been set only a year. I have set out vines, more or less, every year except the four years of the Rebellion, when I was away from home.

My location is one which I consider to be the best for this climate—a southern slope, with ledges and pine-trees in the rear to break off the cold northern winds and also the disagreeable blasts that come from the east. The rays of the September sun striking on the ledges heat them up and thus prolong the warmth far into the night, and consequently the frosts of early autumn are less liable to nip the foliage, and thus retard the ripening. My soil is a gravelly loam mixed with broken fragments of stone, and is in and of itself rather poor; so rough and inaccessible that I cannot cultivate much with a team, and as I cannot raise cultivated crops there, I have planted grapes. If anything is done to my vines after well setting out, and an occasional top-dressing of tan-ashes, it is a light hoeing and top-covering or mulch of old meadow hay, weeds or wood-wax.

As it is customary to cut and prune the vine, I used to follow in the beaten track marked out by theorists. Of late years I have not used the knife so freely, and am well assured that I have been more successful as to good, well-ripened wood, and also in fruit. My vines are trained in various methods; some are on cedar-pole trellises, others are trained

to wires stretched to stout locust-posts set firmly in the ground, while some are allowed to run over an old stone wall just as nature taught them.

The way that most of my vines are managed is this: I cut red-cedar posts about ten feet long, and trim off the branches from six inches to three feet from the main stem. These posts I set from two and a half to three feet into the ground, and about six by ten feet apart. To each post I set one vine. I have learned that vines trained in this way are less trouble to manage and seem to do better in every way, being less liable to mildew and disease, the air circulates freely among them and the sun's rays will strike nearly every part. The consequence is that better fruit and larger clusters are obtained.

If I trim my vines, I generally do the most of it in the fall, sometime at the last of October or November; but I always cut off any offending branch when I feel disposed at any season of the year, and have never seen any bad effects from bleeding after severing a branch.

There are some two hundred vines on my premises, and as fast as one dies out or is pulled up I generally set out another, usually a year old layer. I have now in bearing condition, the Concord, Ives' seedling, Iona, Dracut Amber, Clinton, Hartford Prolific, Delaware, Taylor's Bullet, Elsingburg, Black Hawk, Allen's Hybrid, and the following of Rogers' Hybrids Nos. 1, 3, 9, 13, 15, 19, 22, 39, 41, 43, 44, 33, besides several seedlings of native grapes, which are rather poor and foxy, having only the desirable qualities of early ripening and the hardiness and vigor of an oak.

It is hard to decide which of the varieties is best suited for our climate; some years one kind will lead all others, while in other years it will fall far in the rear. Generally speaking, those varieties which are the hardiest in wood and best to ripen up the buds early in the fall, and the fruit also, have this fatal habit of giving only very poor flavored berries; while those of the rich perfume and sugary flavor are apt to be tender in wood and liable to be attacked by mildew, and are so late in ripening their fruit that it is almost impossible to get any fit for the table.

Rogers' seedlings are, I am sorry to say, rather too tender

for our county, and are so subject to mildew and disease that only few should be attempted. It is a pity that such splendid fruit should be hampered with a parent stem so weak and liable to disease. Of all the grapes ever grown on my grounds I should prefer Rogers' seedlings, if they were earlier and more hardy, particularly Nos. 3, 9, 15, 19, 22, 30, 39. Persons who plant Rogers' vines should never neglect to cover them in the fall, for if they are left without protection through the winter they are almost sure to be killed.

For all locations and all soils I should prefer the Concord above all others, taking all its points into consideration. While I know there are many that are far its superior in flavor and richness of fruit, it has no rival in hardiness or productiveness under all circumstances and in all localities.

A few vines of the Iona, Delaware, Hartford and Crevelling should be planted, and if one has a warm, sunny nook near his buildings, let him plant the Allen's Hybrids, or if he prefers it, the Rebecca. Both are white grapes and excellent in flavor.

Of all the diseases to which the vine is subject, mildew seems to be the most fatal; vines that are attacked soon lose their foliage, and the berries stop growing and never ripen, but hang, an unsightly spectacle in the vineyard. Flower of sulphur is the best known remedy for mildew. It is applied to the parts attacked as soon as the disease makes its appearance, and is best put on while the vines are wet with dew. Some use bellows to apply it, but I think a good-sized pepper-box about the best thing to use while doctoring the plant. Constant care and watching is necessary, for the disease must not be allowed to spread. If it is to be checked at all, one must begin early to combat it. If allowed to have its course, the result will be no crop of grapes for that year.

Rose-bugs sometimes come in myriads and destroy both fruit and foliage. I know of no way except to kill as many as possible by hand-picking. I have tried tobacco-water, whale-oil soap and lime, all to no purpose; the bugs seem to be proof against all the poisons usually adopted to destroy insects.

After twenty years of study and labor among trees and plants, I would not recommend any one to set out a vineyard

in Essex County in the hope of ever making it a remunerative employment, much less would I suggest the possibility of ever procuring a first-class grape by planting the seeds of any of our wild native sorts. While they have hardiness and earliness, they are all of them foxy and lack nearly all the essential qualities accorded good fruit. Besides, out of a hundred seedlings, perhaps not more than two or three will ever bear at all, and these seldom come up to a higher standard than the parent. Let every man who has a few rods of spare room in his garden set out a few vines of those varieties best suited to his taste. Don't try to get every new sort you see advertised, and don't place too much credit in the high-sounding story told by the printed circulars you will from time to time receive just as soon as you begin to plant grapes and your name becomes known to the vendors of nursery stock. Set out a Concord or two for your stand-by, and you may put in as many of Rogers' Hybrids as you have time and patience to take care of. Never forget to cover all of your Rogers' vines every winter. I throw mine down on the ground and cover with hay or earth about three or four inches deep and remove before the vines start in the spring. Vines should be uncovered and tied up to the stakes before the buds swell, as they are very tender and easily broken off in handling.

In conclusion let me add, that it has been of much pleasure to me to be among my vines, and if I have not made it pay in dollars, I have had enough fruit for my family and some for my friends, and besides, there is a solid satisfaction in gathering the fruit that has been produced by the labor of one's own hands. If it does require constant care, it takes up the spare moments that are usually lost, or spent in some other employment that amounts to no more in the end than growing grapes.

Statement of George W. Gage, Methuen.

My vineyard is located on a southern slope about one-third the way up and one hundred feet from the valley below. The soil is friable, with gravelly bottom, naturally drained. It contains three hundred vines, the oldest of which is fifteen years, the youngest five years. My first planting was fifty vines, on

a patch from which I had taken two crops of apple-trees (one too many), the residue of the vines on nursery ground, from which one crop of trees had been taken. Fertilized at planting with animal manure, afterwards an annual dressing with ashes or potash and bone.

I sometimes start with cuttings and layers, but the best method is with single eyes. After several years of slip-shod training, I believe the following to be the best. Commence with one or two year old vines, cut down to two eyes, allowing them to grow about as they will, except training them to stakes. In November cut down to two eyes. Second year train same as first. Third year erect a trellis about like those recommended by Mr. Fuller, Dr. Fisher and others, with posts eight feet long, set two and one-half feet into the ground, the end post to be at the first vine, the next post nine feet therefrom and the others six feet apart, bracing the outside post. Rows eight feet apart, vines six feet apart in the rows. Stretch No. 15 or 16 of galvanized wire upon these posts, the lower wire twenty inches from the ground, the next wire fifteen inches above the first, the third fourteen inches above the second, and the fourth fifteen inches above the third, ending the trellis with the fourth wire. Beginning with the third year, allow one shoot to grow from each vine. The end vine of the row train to and along the third wire, the arm turning from the post. Next vine carry to the first wire, the next to the third, and so on alternately through the row, all the vines turning the same way. As they grow, nip the laterals at the second leaf, and when the shoots have grown six feet nip the ends off. The autumn pruning consists in cutting off the laterals and cutting back the main shoot to good, strong wood.

At the fourth year, as buds push a shoot each,—if two, rub out one,—and show their clusters of grape-buds, and have made two or three leaves beyond the last cluster, the end of these shoots should be nipped off as soon as they have made sufficient growth and are strong enough not to break, tie them to the second or fourth wire, as the case may be. As laterals start on the upright shoots, pinch in at second the leaf and continue to do this the entire season. Now, the question comes, How much fruit shall I let remain on the vines? Shall I allow each shoot to start with three or four clusters, and at

the close of the season have a very large crop of half-grown, unripe grapes with which to crowd the market with Concords at one dollar per bushel, as has been the case the present year, or shall I aim for a harvest of large, well-ripened berries, upon clusters weighing from half a pound to one pound each, selling at remunerative prices, the purchasers saying these grapes did not grow out of doors, how is it that you grow better grapes than any one else? I can show you a man to whom a dealer has within a month offered twenty cents a pound for Concord grapes. Quality rules. At the same time we are caring for this year's crop we must have a good look-out for the next one. Upon the vines where a strong bud starts, the shoot from it should be trained up and along the wire in an opposite direction from the bearing arm, except the vine planted at the end of the row. This vine's fruiting arm, as also its arm for next year's fruiting, is to be turned the same way. Take good care of the young arms, for from them comes your next year's crop. Pinch out the laterals at second leaf, and if they start again repeat the operation; stop the shoot when six feet in length.

The fifth year we do as we did the fourth, excepting the first vine in the row, the bearing arms grow one way and the growing arms the other; thus the vines are renewed year by year.

A vineyard, properly cared for, is surely good for this generation and the next, and I believe for a longer period.

The varieties I should recommend for Essex County are the Concord, a few Delawares, and try Worden's seedling, and John B. Moore's Early Black when he will let you have them.

A word about peach-culture. My soil is the same as for grapes, fertilizing also same as for grapes, substituting salt for bone. I have about one hundred and fifty trees in bearing, planted eight years ago. In 1872 I had fifty bushels of good fruit, in 1874 one hundred and thirty bushels of first-rate fruit. In 1873, in an orchard of about one hundred trees, the yellows appeared and are spreading through the orchard. The rule should be, if a tree is affected by it, to immediately remove and destroy it, root and branch. A liberal use of salt and unleached ashes may be a preventive.

HAMPSHIRE, FRANKLIN AND HAMPDEN.

From the Report of the Committee.

A few years since, the Hon. William Clark, of Northampton (since deceased), presented a Concord grape-vine to each and every family in the town. It would be pleasant to know how many of these vines are alive to-day, and have produced fruit for the planters. Judging from the quantities brought into town from the West and South, we must infer that but few yield anything. We venture to say not ten per cent. are alive. Ten or twelve years have passed away, the vines are dead and gone, and many of the planters of them have gone, too. New planters have taken their places. The field is open for our report. We say Northampton, but mean all the county and territory that this society covers.

The *new man* asks, "What kind shall I grow?" Our answer would be, plant some kind to begin with. There is no kind of an ordinary grape which cannot be made an article of luxury in the common economy of a family. Pickles, preserves, wines, vinegar and table fruit are all needed. In Europe, even the twigs and buds are mashed, juice extracted and made into vinegar. "Corn, wine and oil" symbolize plenty, and no part of the grape is useless. Well-ripened bunches never pall upon the appetite.

We would further answer, plant several kinds. We know we are treading upon the toes of epicures and exquisites in grape-culture. It is not for them that we are reporting.

For an agricultural society, the position we would take is, get grapes of some kind, bring them to the fair, compare them with those of your neighbors, and your taste will grow with what it feeds upon. Therefore, we recommend no one kind. Were we to plant our garden anew, in its present location and exposure, we should put out Northern Muscadine, Dracut Amber, Hartford Prolific, Salem, Delaware, Concord, Diana, and Crevelling, and, perhaps, be experimenting meanwhile with some others. If we had a very warm corner upon the south-west side of a building, we might put down an Isabella. If a family wants grapes for all the purposes which we have heretofore named, one Concord vine won't answer.

There must be a variety. To have all of the above varieties would not require a large space of ground. A garden and yard are always "open at the top." A piazza, a trellis, the side of the house, the side of the barn, will accomodate several vines. They are as ornamental as honey-suckles or wistarias, and don't take up any more room. The nearer to the house one gets a vine, the more food it gets from the wash-tub. The perfume of the flowers and of the fruit is always pleasant and exhilarating.

It is not necessary in this report to give our opinion which and where is the best place. We are writing for family use, not for a vineyard, writing for younger members of the society and their friends. Hence we have said, plant somewhere on the homestead. If possible, plant on warm, dry soil, and in a place sheltered from the early morning sun, and the cold north and west winds. We have grown them upon all sides and exposures,—east, west, north, and south sides of buildings; on trellises, trees, and stakes; in gravel, sand, loam, and muck, and have come to the conclusion that one-half of the growth depends upon the grower, the other, the variety planted.

About pruning. "First catch your hare, then dress him." Three or four years' attention to growth, and the experience therein acquired, will teach one about what to do. We are of the opinion, however, that few people prune too much.

"I wish I could grow such grapes on my place as you have here on this table," said a member of this society to one of your Committee, three or four years ago. "Why not?" was the reply. "Oh, my place is so elevated and cold, and the winters so long, that they won't grow and ripen." "Will you take some vines and try?" He took some vines and tried. Last year the man took to one of our county fairs the fairest and best grapes on exhibition. They were grown upon the south side of a barn-yard wall. It is proper here to say that he was proud of his success, and he believes in grape-growing for family use. Is there another farm in that town where some spot could not be found equally favorable to the growth of the grape? Are there ten more farmers in that town who could be stimulated by his success to do likewise? It is of little importance to us, members of this society, what

would be best for vineyard culture. It is for home use that we labor. Climate and soil have been conquered by the skill of the laborer. No country in the world grows such beautiful exotic grapes as Scotland. No country in Europe is seemingly more unfit.

So far as our climate is concerned, we have examples of vineyard culture, and of good success. That success, in a single instance, should incite us to grow enough for home consumption in our families. Now, how many grapes ought a family to consume? Some of your Committee believe, from actual experiment, that a family liberally provided for can use a good many pounds. With a good assortment of varieties, the supply can easily extend over several months. And a box of grapes is convenient at any season. We don't know of anything more relishable before breakfast. They are certainly enjoyable at dinner, and if you happen to see a bunch or two after supper, one can manage to dispose of them in the usual way. Where a whole family of six or eight comes in for each a share, several thrifty vines will be needed to grow the supply.

The beautiful specimens of hot-house and exotic grapes on exhibition should elicit a sentence of comment from your Committee. There is no mystery about raising grapes under glass any more than out of doors. Different persons possess different qualities of skill and experience, and there will be as much difference in grape-growing as in tobacco or corn growing. There are certain conditions of soil, exposure, manure and pruning in both cases. The two prime conditions are: first, a good, dry border for the roots of the vines; second, a covering of glass, to secure the requisite moisture of the atmosphere, and, more particularly, to protect from the early frosts in the spring and late frosts in the fall. The practice of one of your Committee in the matter of ventilation has been never to close the ventilators and doors of his cold grapery from the 10th of June till danger of frosts in autumn. The annual exhibitions at our fairs must be the test of his success.

The general summing up of your Committee would be: raise grapes, raise the best you know, raise plenty of them for the whole family, raise some for the neighbors, and

encourage them to plant and raise for themselves by giving them roots and cuttings.

The past season in many respects has been an unfavorable one for grape ripening. Many people lost their crops before fairly ripe. Yet others were successful enough to make a good show at our fair, and keep up their courage for another season.

H. K. Starkweather, *Chairman.*

PLYMOUTH.

From the Report of the Committee.

With few exceptions all are benefited by the use of apples daily, either cooked or uncooked. They should be eaten just before, and form a part of the meal, rather than as is too commonly the case, a sort of adjunct after the stomach is already well filled. This may seem a trifling matter, but it is mostly attention to just such trifles that makes us happy or miserable in this life. The value of the apple, physiologically considered, cannot be overestimated. The general failure of this crop for quite a number of years almost, at least for a time, discouraged the universal planting of this noble fruit. The conditions seem to be gradually changing, and it is to be hoped that with care we may yet grow all our own apples, and not depend on other States for our supply. More than four thousand barrels of Western apples have been disposed of in one town in this county, in some seasons when our own apple crop was a failure. The average price could not have been less than $3.50 per barrel, making the sum of over $14,000 paid in one town. One-half this amount distributed among the producers of this same town would have made many a hearthstone happy. I am quite certain that in a season of scarcity, more than $50,000, after deducting the commissions to the seller, are paid in Plymouth County for apples.

In the cultivation of apples, as well as other fruits, more attention should be given to *general principles*, and not all the thought and labor spent in a particular direction, or on some

technical point. For instance, if the soil is so poor, that all the efforts of the tree are expended in the production of leaves, it is useless, for the production of fruit in that instance, to dabble with nostrums for the extermination of insects. Insects are a legitimate result of careless cultivation; weakness invites disease: hence trees, on poor soil or uncared for, will always be afflicted, and suffer more than the vigorous tree in a generous soil. Strong, retentive soils are the best adapted of any in Massachusetts for apple-orchards. A fact, mentioned by Mr. Barry, of Rochester, N. Y., about a quarter of a century ago, in regard to selecting localities for the apple, seems to be lost sight of. In substance it is this: The ashes of the bark and wood of the apple-tree show that of one hundred parts about fifty are of lime; hence the inference is drawn that soils abounding in lime, the other conditions being present, would be the best adapted to the production of the fairest and best-flavored fruits. Such we find to be actually the case, and all the regions of Western New York, Vermont, and some portions of Maine, that are rich in lime, give us the best fruits that we consume, for this applies to the pear to nearly the same extent as to the apple.

Lest some may suspect that this vigor and beauty is due to strong, new soil, which I know from personal appearance has a powerful influence in this direction, I will observe that, seventy years after planting, in New York, the trees and their fruits show these same well-marked characteristics, proving conclusively to the writer that the application of lime in some form,—for this so far as I know is experimental,—would result in a permanent invigoration of our orchards. To make them permanently valuable, it has been suggested for years to remove a part of the fruit in even years. It does not appear, however, that this has been practised to an extent sufficient to satisfy fruit-growers of the value of the plan proposed. Every amateur practises this every year, but for a different purpose; viz., to get more perfect specimens the same year. Now I am of the opinion, from personal experience in this last direction, that if, commencing with an apple-tree as soon as it is large enough to set fruit, we *every year*, until the tree gets its normal growth, remove two-thirds of the fruit, we should thereby induce a habit of regular bearing that would

render the tree of double value. As the fruit-buds are formed the preceding year, the removal of one-half the specimens would not, I think, have the desired result. It would be a labor of magnitude to do this with large trees in a large orchard, but if commenced when the trees were young, the labor would be less every year. Let all having orchards, whether large or small, give this matter a fair trial for *several* years, on *one* tree at least, and note the result. The fruit will certainly be of enough additional value to pay for the labor expended. The most effectual method of exterminating insects,—cheap, and in the largest way effectual,—is accomplished by inclosing the orchard with a suitable fence, and giving poultry the range of the premises. In these days when it is fashionable to rear poultry, and the profits are somewhat questionable, it is quite certain they would all have an increased value if used in this connection.

The main crop should be of few varieties, and in selecting them attention should be paid to those that are the most vigorous and productive in our own locality. An apple may be beautiful in appearance and of the first quality, and yet quite unprofitable to cultivate. As a rule, the more varieties the less profit. The following list we do not think can be improved, although locality may add or diminish one or two varieties: Red Astrachan, Porter, Hubbardston, Gravenstein, Baldwin, Rhode Island Greening, Roxbury Russet.

Loring W. Puffer, *for the Committee.*

RENOVATION OF FRUIT-TREES.

BRISTOL.

Statement of H. P. Crocker.

The orchard was set out about thirty years ago. It made a good growth for about thirteen years; about that time it passed into another person's hands. This party desiring grass more than fruit, laid it down to grass. It remained in this condition some five years. This treatment stopped all growth; it was completely perforated with borers. The number set out was forty; ten were dead, leaving thirty, which is the number that I enter.

At this time, and in this condition, I bought it, which was some twelve years since. The orchard was considered worthless by the owner, and the previous one, but not so by me, as I had some experience with orchards, although it looked like a "sore job."

Process of renovation: First, I destroyed all borers by probing with a wire, cutting out with a knife, and scraping up that year's deposit of eggs. Next, I ploughed the soil of the orchard, and manured it. The first year the orchard did not make much growth, of course. The next year it made some growth, and the cavities made by the borers commenced to heal. The third year I manured and ploughed again. This year the whole orchard made a good growth; most of the trees did not produce desirable fruit. The fourth year it was in growing condition, suitable to commence to graft. Those who are acquainted with the process of grafting, know it requires three years to graft a tree perfectly. At the expiration of that time it was completed. My system of managing an orchard is to plough and manure every other year. This I have done, and, of course, kept it free from all insects, and properly pruned.

The result, or present condition: Last year it was well loaded with the choicest fruit, of all varieties, that can be produced in New England. This season it is bearing moderately. There are many improvements to which I shall call the attention of the committee when they visit the orchard.

The orchard is situated on a southern slope. The upper half is a light and sandy soil, but as you go down it becomes more heavy. The first two rows of trees stand on rather damp and heavy soil, and do not bear as well as those on the upper and middle of the orchard.

GRAIN CROPS.

ESSEX.

Statement of Oliver P. Killam.

Indian Corn.—The crop of 1873 was English grass; that of 1874 Indian corn. Twenty-one cords of long manure from the barn cellar were used on four and a half acres, as nearly equal as could be. The soil is a dark, gravelly loam. The ground was ploughed once eight inches deep, and afterwards harrowed and furrowed three and a half feet apart each way. The cost of harrowing and furrowing was $2.50 per acre; cost of ploughing $3.50 per acre. Fifteen loads of manure were used on each acre, three loads being equal to one cord. The value of the manure on the ground was $9 per cord. Three hundred pounds of Cumberland superphosphate was used, at a cost of $7.50 per acre, planted from the 15th to the 20th of May, three and a half feet apart each way, using about six quarts of eight-rowed corn to the acre. Cost of seed and planting, $5 per acre. The crop was cultivated three times each way and hoed well once, and after harrowing, the weeds were thoroughly cleaned out. The cost of cultivating, hoeing and thinning, was $5 per acre. The corn was cut close to the ground the last week of September, four hills laid together and six bunches put in each stook, using a stooking-horse and birch withes drawn around each one to hold it together. The corn was drawn to the barn from the 15th of October to the 8th of November and husked, the fodder bound in bundles and set, butts up, to cure. The cost of harvesting, husking and storing, was $12.50 per acre. There were on four acres 626¼ bushels of sound corn, averaging forty pounds to the bushel. The amount on one acre, 176¼ bushels of sound ears, forty pounds to the bushel; also eight bushels of green corn, half of which would be fair corn when dry. After carefully weighing a portion of the fodder, my esti-

mate of the amount is not far from six tons per acre at the time of husking; when thoroughly dry, it would weigh much less. I consider the fodder twenty-four tons, and worth $8 per ton. I sold at home about eight bushels of the corn after it was husked, $1.40 per bushel, seventy-five pounds to the bushel. About thirty bushels of green corn in all, worth about half price. Twelve hundred pounds of Cumberland superphosphate were used on the four acres, which cost $30.

MIDDLESEX SOUTH.

Statement of E. F. Bowditch.

Indian Corn.—My corn-field measures about nine and a half acres, and was in grass in 1874, and has had no manure for three years. The nature of the soil is dark loam, with a sandy clay subsoil; the field was ploughed once, seven inches deep, in October, 1874, and harrowed twice in May, 1875.

Cost of ploughing and harrowing, ...	$42 00
I applied 4,389 pounds sulphate ammonia; 1,681 pounds muriate potash; 1,543¾ pounds boneblack, treated with 771⅞ pounds sulphuric acid. One-half the above amount was spread broadcast, and the other half strewn in the drill and covered with the foot before dropping the seed. Cost of manure, ...	310 77
Cost of mixing, carting and spreading the same, . .	12 87
The field was planted by hand, May 26, 1875, using about two bushels of seed (northern eight-rowed). Cost of seed and planting, ...	15 25
The crop was harrowed with a smoothing harrow once, horse-hoed both ways twice, and hand-hoed at three different times, at the expense of	43 75
	$424 64
The crop was cut and stooked September 17, 18, and 20, at an expense of	28 50
The estimated cost of husking 1,097¼ bushels corn, at 10 cents, ...	109 72
The estimated cost of stowing stover, at $7.50 per acre,	71 25
Interest on land and taxes, ...	50 24
Total expense, ...	$684 35

Credit by 54 tons 1,726 lbs. stover (estimated at 100 pounds stover to 1 bushel shelled corn), at $8 per ton,	$438 90
Cost of 1,097¼ bushels corn,	$264 45
Cost of 1 bushel shelled corn, 22 4/10 cents.	

Statement of P. McMahon.

INDIAN CORN.—The two fields of corn which I enter for premiums, contain about four and a quarter acres. One three-acre field I have withdrawn, as the worms cut off a great deal of it in June. I mention this in order that you, and all who may read this, will not think that I went in for a small field and doubled the manure on it in order to get a premium. I have planted six acres a year for the last seven years, and have manured from the barn cellar and hog-pens. My rule is, eight cords to the acre of number one manure. From the barn-yard I top-dress four acres of grass-land, which I think is thoroughly manuring; ten acres a year from twenty-five head of cattle and from four to eight swine, as it may happen; that gives me five years to get over the ploughed land, which contains fifty acres.

Number two field, which I have entered for premium, contains about one and a quarter acres. In 1873, one part of it was pasture land, and the other part run-out mowing land. The soil is a deep blackish, with a yellow clay subsoil, manured in 1874 with eight cords to the acre, planted part with corn and part with potatoes. In 1875 it was manured with eight cords to the acre, ploughed in and planted May 18, cultivated three times both ways, hoed three times, and weeded and sprouted.

Expense of ploughing and harrowing,	$4 00
Value of three cords manure in cellar, at $8 per cord,	24 00
Carting and spreading,	10 00
Seed, furrowing and planting,	2 00
Cultivating and hoeing three times,	9 00
Sprouting,	1 50
Cutting and stooking stalks,	2 00
Harvesting and husking 278 bushels (which is the number of bushels I had on one acre),	22 00
Interest and taxes,	2 50
Total expense,	$67 00

Mr. Newton, surveyor, with the committee, measured one rod, harvested and weighed the same, which weighed 63¾ lbs. This, multiplied by 160, and divided by 72, only makes 141¾ bushels of shelled corn.

One hundred and forty-one and three quarters bushels shelled corn, at $1 per bushel,	$141 75
Three hundred and thirty-three bundles of stalks at twelve and a half cents per bundle,	5 00
About two tons of husks,	20 00
Value of crop,	$166 75
Deduct expenses,	67 00
Net,	$99 75

HAMPDEN EAST.

Statement of J. K. Knox.

Indian Corn.—The field of corn which I have entered for the society's premium, contains about three acres of a sandy loam soil, and was cropped in 1874, about one-half with corn and the other half with potatoes, with no other fertilizer than a little salt and plaster. This year the land was ploughed the first week in May. Manure ploughed in at the rate of thirty-five cart-loads, of thirty bushels' capacity each, and planted on the 19th and 20th of May; and in one-third of the field I put into the hill about one cord of a compost of earth and rotten chip-manure and night-soil, and in one-third a similar amount of compost, with hen-manure instead of night-soil, and in the last third I used two hundred pounds of Bosworth & Bugbee's superphosphate, mixed with an equal quantity of plaster. The consequence was a very quick start of the crop and rapid growth, which ripened early, and is decidedly the soundest and cleanest crop of corn that I have ever raised. It was difficult to know which of the first two fertilizers made the most corn, but they were both ahead of the phosphate. The corn was so ripe and dry that I had some of it ground into fine bread meal the 20th of September. The crop was cut up the first week in September, putting five rows in one, setting it up around one hill on the centre row, one man following the two cutters and tying the tops with

two bands above the ears. I also planted beans among the corn one way, and raised twenty-six bushels, that sold at $2.25 per bushel; and at the second and last hoeing, I sowed grass-seed, and hoed flat, or rather used garden-rakes to do this hoeing.

The following is the measure and weight of crop of corn which I took from just three acres, having husked a little of the field before I measured off any. On the three acres there were 332 baskets of forty-one pounds each, or 13,612 pounds, while 69½ pounds gave fifty-six pounds shelled corn, and an average of $65\frac{11}{13}\frac{9}{9}$ bushels per acre for the three acres. Now as to the fodder, there is too much of that; I have no room for more in my barns. If I am to raise any more, I want a kind that will produce more corn and smaller fodder.

DEERFIELD VALLEY.

Statement of A. R. White.

Indian Corn.—The field of corn which I enter for premium contains one acre. The soil is a heavy loam, clay subsoil, and quite stony. Most of the piece was never ploughed until I ploughed in 1873, it being very rough, covered with banks and stones. The crop of 1873 was potatoes, with no manure except tobacco stalks in the hill, except a small part of the piece which had been ploughed years before; the crop on this part was tobacco, manured with cattle droppings from vault under stable at the rate of forty loads of thirty bushels each. The crop of 1874 was Hungarian grass, with no manure. The ground for the present crop was ploughed the 27th day of May six inches deep, and harrowed only sufficiently to level the furrows. One-half of the piece was furrowed about six inches deep, 3½ feet apart, and manured in the hill with hog manure made from muck loam and waste from the kitchen, at the rate of eighteen loads to the acre; the remainder had, at the rate of thirty-five loads to the acre, of stable manure ploughed under. The rows were 3½ feet apart, hills three feet. One gill of wood-ashes was put in each hill. The piece was planted the 1st of June by hand; I planted twelve quarts of seed, the eight-rowed variety. The field was cultivated twice during the season, and hoed

once. Harvested the 12th of September by cutting up at the roots. The corn was shelled and weighed the 13th day of November. On the piece where the manure was spread and ploughed in I had 2,340 pounds sound corn, or at the rate of 83$\frac{4}{7}$ bushels per acre, and 5,400 pounds of fodder per acre. On the part manured in the hill I had 2,060 pounds of sound corn, or 36$\frac{11}{14}$ bushels, being 73$\frac{4}{7}$ bushels to the acre, and 2,200 fodder, or 4,400 pounds to the acre. I make no mention of soft corn, as there was but little, not more than five baskets on the piece. In statements of debit and credit I make two statements, and make them as though each part contained one acre, more easily to show the profits of each. Where the corn was manured in the hill, it was more forward than where it was spread on; but the yield of corn and of fodder was much the largest where spread on.

I consider that in this experiment each bushel of ashes gave me one bushel of corn; and the land where manure is spread and ploughed in is in much better condition for future crops, besides less labor to apply and plant the crop.

STATEMENT OF EXPENSE AND VALUE OF CROP OF CORN.—PIECE WHERE MANURE WAS SPREAD ON.

Expense of Crop.

Cost of ploughing,	$4 00
One-half value of manure, $35,	17 50
Drawing and spreading manure,	5 00
Cost of seed and planting,	4 00
" cultivation,	5 00
" ashes,	3 00
" harvesting,	10 00
	$48 50
Interest on land,	6 00
	$54 50

Value of Crop.

83$\frac{4}{7}$ bushels corn at $1,	$83 57
5,400 pounds fodder at $10 per ton,	27 00
	$110 57
Deduct expense,	54 50
Net income,	$56 07

STATEMENT OF EXPENSE AND VALUE OF CROP OF CORN.—PIECE MANURED IN THE HILL.

Expense of Crop.

Cost of ploughing,	$4 00
One-half value of manure,	9 00
Drawing and putting in hill,	5 00
Cost of seed and planting,	6 00
" cultivation,	5 00
" harvesting,	10 00
Interest on land,	6 00
	$45 00

Value of Crop.

73⅘ bushels corn,	$73 57
4,400 pounds fodder, at $10 per ton,	22 00
	$95 57
Deduct expense,	45 00
Net income,	$50 57

Statement of C. E. Cooley.

INDIAN CORN.—The piece contains two acres, lying on the bank of the Deerfield River. The soil is a sandy loam, sand predominating. The crop of 1873 was hay, 1,500 pounds to the acre. No manure was used that year. The crop of 1874 was corn. Used seven cords of stable-manure to the acre. The corn was badly eaten by cut-worms, consequently I harvested a small crop. For the present crop, ploughed the 15th of May, six inches deep; applied seven cords of stable and sheep manure per acre in the furrow; worked it in with a pulverizer, and smoothed with fine harrow; marked both ways, distance 4 by 3½; planted May 22 and 24 with Canada cap corn; used Bradley's phosphate in the hill; 150 pounds per acre; cultivated both ways, and hoed the first time the middle of June; at the same time applied ten bushels of wood-ashes per acre by putting a handful upon each hill. Hoed the second time July 2, cultivated one way and thinned to four stalks in each hill. No other cultivation

except cutting up the weeds among it about the first of August with the hoe; harvested the middle of September, and husked the last of October. The yield was 102½ bushels per acre, shelled corn; stover weighed eight tons.

Cost of Crop.

Two acres, ploughing and preparation for planting,	$8 00
Planting,	8 00
Cultivating, hoeing and thinning,	15 00
Harvesting and husking,	25 00
Seed,	1 50
Applying ashes and phosphate,	3 00
Cost of same,	12 00
Manure removed by crop,	56 00
Total,	$128 50

PLYMOUTH.

Statement of John Sample.

Indian Corn.—The land I planted with corn had been in grass some ten years, without manure, and, for the last five years, had yielded but about ten or twelve hundred pounds of hay per acre. The soil is a sandy loam. Upon the acre I entered for premium, forty loads of manure, of thirty bushels each, was spread and ploughed in, seven inches deep, May 18, 1875, the ground harrowed three times, and furrowed one way; planted May 22, in rows three and a half feet apart, and in hills two feet apart in the rows, using twelve quarts of smutty white corn; a handful of hen-manure, mixed with three times its bulk of soil, was put in each hill, and eighty bushels of leached ashes spread upon the tops of the hills after planting; cultivated twice with a cultivator, and hoed twice; the stalks were cut September 16, and the corn harvested October 20. The seed came up slowly, owing to the dry weather; but after it came up, the growth was rapid, and the corn ripened off well, being but very slightly injured by the early frost. The ashes put upon the hills I should have spread broadcast, before planting, but for delays in getting them. The product was 93$\frac{10}{56}$ bushels of corn and about three tons of stover.

Expense of Crop.

Ploughing and harrowing,	$5 00
Manure,	74 00
Seed and planting,	5 00
Cultivation,	6 00
Harvesting,	9 00
Total,	$99 00

From which a reasonable deduction should be made for the value of the manure and ashes remaining in the land, and chargeable to future crops.

Statement of Albert Thomas.

The acre of corn I entered for premium is a strong sandy loam, having a northerly exposure; it was mowed in 1873 and 1874, no manure being applied; ploughed May 11, 1875, eight inches deep, turning in forty loads, of thirty bushels each, of barn-cellar manure; harrowed and furrowed; planted May 25, in rows three and a half by three feet apart, putting in the hills fifteen bushels of a mixture of equal parts of ashes, plaster and hen-manure, and using twelve quarts of Whitman corn; cultivated both ways twice, and hoed twice. Product: $89\frac{2}{56}$ bushels of corn and three tons of fodder. The corn was very good, though not quite as heavy as it would have been had it been fully ripe before being touched by the frost. I think one-half the manure remains in the ground for future crops.

Expense of Crop.

Ploughing and harrowing,	$8 00
Manure,	56 00
Seed and planting,	4 50
Hoeing,	8 00
Harvesting,	6 00
Total,	$82 50
My corn I consider worth $1 per bushel,	89 87
And fodder, $12 per ton,	36 00
Total,	$125 87

DEERFIELD VALLEY.

Statement of S. W. Hall.

Wheat.—The quantity of land sowed, $1\frac{3}{4}$ acres. The crop upon the land in the year 1873 was grass, without manure. In 1874, the crop was corn; four cords of manure was used per acre; yield, fifty bushels per acre. The land was in good condition; in the spring of 1875 it was ploughed six inches in depth; was sowed May 1 with wheat, and well harrowed. Harvested in August; yield, forty-one bushels; value of same, $61.50; $1\frac{1}{2}$ tons straw; value, $15; total value of crop, $76.50.

Cost of Crop.

Ploughing and sowing,	$6 00
Three bushels seed-wheat,	4 50
Harvesting and threshing,	8 00
Use of storage,	20 00
Total,	$38 50
Net profit,	38 00

I practise soaking my seed in strong brine before sowing, to prevent smut, which is an effectual remedy.

Statement of A. R. White.

Field Wheat.—The field of wheat which I enter for premium contains one acre. The soil is a clayey loam, with heavy clay subsoil. The crop of 1873 was barley, with no manure. The crop of 1874 was corn, with thirty loads of thirty bushels each of cattle-manure, ploughed in. For the present crop it was ploughed but once; no manure was used, and it was sowed to wheat the seventeenth day of May; two bushels to the acre of seed,—China-tea and red-club mixed. The sixth day of August cradled and bound the piece, the straw standing perfectly erect. The acre yielded 1,845 pounds of wheat, $30\frac{3}{4}$ bushels, and 2,185 pounds of straw. Not more than two-thirds of the straw is included in the weight, for, it being weedy at the bottom, and as I was to plough and seed it this fall, I cut it high, wishing to plough in as much of the straw as I could. I charge ten dollars to

expense of crop for manure taken from soil by present crop, which I think is a full amount.

Expense of Crop.

Cost of ploughing,	$3 00
" seed,	4 50
" harrowing,	1 00
" harvesting and threshing,	4 00
Interest on land,	6 00
Manure previously applied used by crop,	10 00
Total,	$28 50

Value of Crop.

30¾ bushels wheat at $2,	$61 50
2,185 pounds straw at $10 per ton,	10 92
Total,	$72 42
Deduct expense,	28 50
Profit,	$43 92

Statement of C. E. Cooley.

Rye.—The amount of ground sown was 150 rods, the soil (in the main) was a light, sandy loam. The crop of 1873 was corn, manured with six cords of stable-manure, spread on turf, and ploughed under seven inches in depth; then put two cords of compost from barn-yard on the furrow and harrowed it in, the land being in somewhat exhausted condition. The crop of corn was light, perhaps 40 bushels to the acre. The crop of 1874 was corn; used six cords of stable-manure, with a small quantity of phosphate in the hill; crop much better than the first yield, 60 or 70 bushels to the acre. For the crop of rye, ploughed the ground the 20th of September, 1874, six inches deep; sowed one bushel and one peck of rye on the furrow; worked it in thoroughly with pulverizer, then sowed 10 pounds herdsgrass-seed, and harrowed lightly and smoothed down with loaded stone-boat. The middle of April, 1875, sowed six pounds of clover-seed and twenty bushels of ashes on top of a light snow. Harvested the 25th of July; mowed the stubble and grass the middle of September; yield, per acre, 34 bushels 33 pounds; straw, 2,215 pounds; stubbl and hay, 1,960 pounds.

Cost of Crop.

Ploughing and sowing,	$4 50
Seed rye,	1 25
Grass-seed,	1 75
Cutting and stacking,	6 00
Threshing,	4 00
Ashes,	5 00
Total cost,	$23 50

PLYMOUTH.

Statement of James Howard.

Rye.—My rye field, measuring one acre, has a rolling surface, and the soil is hard, gravelly and very stony. The crop of 1873 was potatoes, with five cords of barn-manure ploughed in. That of 1874 was, on one-half Hungarian grass, without manure, and on the other half, corn, with a dressing of barn-manure ploughed in, and a small quantity of bone and ashes in the hills. October 2, 1874, manure to the amount of seventeen loads of thirty bushels each, was ploughed in six inches deep, and five pecks of rye sowed and harrowed in, and rolled, October 5. In April, 1875, 350 pounds of low grade German potash was spread upon two-thirds of the piece, and seventeen bushels of unleached ashes upon the other third. A difference in favor of the potash became apparent in the growth of the rye, within two weeks, and continued to be so until harvest, and there is now, November 1, an equally perceptible difference in the clover, from the seed sown upon the surface in April. The rye was mowed, bound and shocked July 19, and threshed August 7–10. Product: 1,695 pounds, or $30\frac{15}{16}$ bushels of rye, and 2,700 pounds of straw, which sold for $33.75.

Expense of Crop.

Ploughing and other preparation,	$7 00
Manure,	33 63
Seed and sowing,	2 38
Harvesting,	14 00
Total,	$57 01

Statement of Charles A. Latham.

The acre of land on which I raised my rye was in grass, unmanured, during the previous eight or ten years. August 1, 1874, I ploughed half an acre seven inches deep; August 29, harrowed it once, spread on three cords of good compost and three barrels of unleached ashes, and sowed 19 quarts of rye, harrowing it in and bushing it. September 4 ploughed 90 rods adjoining, making in all 170 rods; harrowed it once, and put on three cords of weak compost and 200 pounds of sea-fowl guano; September 7, sowed 21 quarts of rye, and harrowed and bushed it in. The soil is a dark loam, somewhat rocky, but pretty free from small stones. The rye came up well and grew well during the fall, but the long and cold winter killed it in spots, especially on one side of the lot where there is a depression in which the water collected and froze solid to the ground, remaining so, I should think, about two months. When the spring, which was quite late, finally opened, I found the rye so badly killed on about ten rods in the lowest part, that I ploughed it up and planted potatoes upon it, leaving barely one acre of the rye, and that somewhat winter-killed in spots. The uninjured part grew rapidly and ripened well. July 20 it was harvested by cradling and mowing, and was threshed by hand August 19–24. I think the crop was better upon that part of the lot where the ashes were put, than upon the part where the guano was applied, but as there was a difference in the compost, and also in the land, I am unable to say which I derived the greatest benefit from. The product was 1,250 pounds, or $22\frac{1}{5}\frac{8}{6}$ bushels of rye, at $1.10 per bushel, $24.50, and 2,923 pounds of straw, for which I received $35.40; total, $59.90.

Expense of Crop.

Ploughing and harrowing,	$6 00
Manure,	37 00
Seed and sowing,	2 00
Harvesting,	10 00
Total,	$55 00

I think the land is now in much better condition than before it was ploughed.

GRAIN AND GRASS SEED.

DEERFIELD VALLEY.

From the Report of the Committee.

Your Committee were struck with the fact that no traces of seed-corn, of ten or more rows, were on exhibition; while a few years since these flint-corns were raised extensively. The farmers, it seems, have returned to the old eight-rowed corn, with its improvement in quality, and we think it a wise return, for the following reasons: The flint-corns are more indigestible, and contain less animal nutriment per one hundred pounds, than eight-rowed corn. The mice and squirrels always knew this. They let flint-corn alone, if they find eight-rowed corn enough. The chit contains a large percentage of the nutriment of corn. This, too, the mice and squirrels always knew. With animals that can gnaw through a plank, the reason for eating only the chit is not a want of power to masticate the harder portion of the kernel, but a reason, we think, allied to the reason why they eat the meat of the walnut, and reject the shell. The chit of the eight-rowed corn is much larger than in the flint varieties. Hence we and the squirrels give it the preference. The want of plant-nutriment is another objection. The chit contains the germ of the future plant, and the nourishment which feeds it for a season. The chit of the flint varieties is exceedingly small. Hence the slender, sickly appearance of the blade. Therefore, we recommend the large-chitted, eight-rowed corn, which has the germ of a robust, vigorous blade, and nutriment, for the vigorous growth of that blade, till its leaves expand to the atmosphere, and its roots strike into the earth, and it draws its nourishment from the elements. Again, the large stems in husking and moulding in the bin, as also the hard, woody

constitution of the cob, which makes it so harsh and indigestible as feed, make these varieties objectionable; and this leads us to prefer the eight-rowed corn, with its small stem, easily husked and dried, and its small cob, which grinds into comparatively soft meal, while its large store of alkali meets in a measure the wants of the milch cow, and all animals whose bones are growing, or need sustaining, from a lack of phosphate of lime in their feed.

Cultivation has much to do with the quality of seed-corn. As well think of raising healthy, robust offspring from sickly, debilitated parents, as to look for seed of full vitality on sickly, stunted stalks, reared on ground illy prepared and illy cultivated. Let the land be well ploughed and pulverized; let your manure not be covered up at the bottom of a deep furrow, at a depth where your fence-post would remain sound for twenty years; but let it be well mixed with the soil in the pulverizing process, near the surface, where your stakes and posts so soon rot. There you have all the elements,—God's skilful agents at work preparing your manure for plant-food. But these agents do not go down deep in the earth to rot your fence-posts. Why should they to work over your manure?

Planting has much to do with the vitality of the seed. No farmer expects to raise seed-corn in a field sowed for fodder. Why not? It is too thick. Well, when there are many stalks in the field, with no ears, or when there is but one ear upon a stalk, and that not filled out, the corn is still too thick; or there are too many stalks in a hill. Our opinion is, that three feet between the rows, and four feet between the hills, and three and four stalks in a hill, will exhaust the land less, for the number of bushels raised per acre, than to stock heavier. One good, well-capped ear on every stalk, and two and three on many, should be the standard aimed at by every farmer, and he should vary his planting and improve his cultivation till he attains to it. No field of corn, choked and shaded and robbed of nutriment by a swamp of weeds, can yield the first quality of seed. Corn should be timely and well hoed, and we think corn well hoed when the weeds are all killed, and the ground made light and as near level as possible. When the soil is level, the roots instinctively spread

over the whole surface of the ground. Hill the corn and you remove the soil from between the hills and rows, and the corn-roots as instinctively reject these soilless places, as the potato-sprouts reject the dark portions of the cellar and reach out for the light. As the soil is heaped up around the stalks, in about a compass of a half-bushel, the corn-roots may be found mostly there, gnarled and knotted up, doing the best they can. Again, if the soil is level, the showers wet the whole surface of the ground, and the roots everywhere find drink. On the other hand, the hills shed all the showers down into the troughs and furrows, where there is no soil to tempt the instinct of the rootlet to run. Nothing but a prolonged rain can essentially benefit the gnarled roots, bound up in these mounds of earth. One word more. If the last hoeing is delayed till the corn has tasselled out, the roots at this stage of growth spread everywhere where there is soil to invite them, in search of food to strengthen for their work, and, as if conscious of their inability, under the most favorable circumstances, they call for help, and the brave roots start forth and plunge into the soil to aid. Both sets of roots now work as near the surface as they can, as if to invoke the most ready and powerful aid of the sun and atmosphere and dews and rains, to aid them in their work of elaborating juice for the stalk, juice to be distilled from the stalk into the kernel and germ and vitality of the seed. The considerate farmer will take his hoe and skim over the surface of his field as lightly as he can, and kill the weeds and break the surface-crust. Thus the roots are undisturbed and uninjured, and the husbandman becomes an accordant helper in this work. By destroying the vampire weeds, and opening the pores of the soil, he has made it possible for the sun and atmosphere and dews and rains to render a more direct and powerful aid in maturing his crop and vitalizing his seed.

Your Committee were gratified to see on exhibition a good specimen of seed-wheat, raised in the Deerfield River Valley, where our fathers reaped such golden fields of this best and most healthful cereal. Every farmer should know that wheat craves lime and ashes in the soil, and that the stalk will be weak, and crinkle and lodge down, and the seed will be shrunk and blighted, where there is a lack of these. Now

our railroads run into all of our lime regions. At our bidding lime in bulk could be delivered at our depots at such prices, we hope to show, that farmers can afford to buy. First, lime is all the good tobacco-grower needs to raise good wheat. His ground is prepared, and in good seasons his crop will be harvested by the 20th of August. Let him sow his wheat the next day, and give his field a good dressing with lime, and he is all right. Secondly, let the farmers who depend upon the process of raising corn and potatoes to rejuvenate their soil, as soon as the season will permit in the following spring, plough and sow these fields with corn. Let the corn grow till the first of July, then plough it well under. Let it lie, and the elements act on the soil till the middle of August. Then let the field be well pulverized and prepared for the seed. The twentieth day of August, let this class of farmers, and also the tobacco-growers, both soak their seed in brine, and roll it in plaster, or plaster and ashes; then sow and harrow it in well. Then sow a liberal quantity of good grass-seed, and roll it in. Then give the soil a good dressing of lime, and in nine years out of ten your golden harvest is sure, every stalk standing erect, every head laden with the choicest seed-wheat. Let those who raise spring wheat not forget the lime and ashes and salt. Now, let no farmer charge all the cost of that time to his field of wheat, rich as it may be, and able to pay. Man craves for the constitution of his body what the animal craves. He has bones to grow and sustain, in common with them. Now wheat, of all the cereals, is charged most heavily with elements which the animal elaborates into phosphate of lime for the growth and sustenance of the bone. Many persons wilt and become sickly on the diet of fine flour, who become healthy on graham and cracked wheat. Such are ready to ascribe all this benefit to the virtues stored in the hull; whereas, they should take into the account the fact that much of the flour is made from blighted wheat, grown on soil much exhausted of lime, while for graham and cracked wheat, the most plump and robust wheat in the market is selected. Wheat grown on soils not yet exhausted of their lime quality, just such wheat as we propose the farmers of New England shall raise, full of nutriment and phosphates and vitality; wheat that will not only

restore the partial invalids, but prevent the farmers' wives and children from becoming invalids. Now, what is that worth? Item 1. Then, there are the following crops of hay, much finer in quality and larger in quantity. What is its enhanced value? Item 2. Then what is the enhanced value of your stock, fed on that better quality of hay? Item 3. Now, add these three items, and subtract the sum from the cost of the lime, and charge the balance to your rich field of wheat.

The question of affording the cost of the lime, ashes, plaster and bone-meal for the wheat, resolves itself into the question whether a farmer can better afford to raise a field of straw alone, or what is about a maximum yield, on lime-exhausted soils, ten or fifteen bushels per acre; or raise thirty and forty bushels to the acre, on robust straw, standing erect till harvested? Fed on the latter, his wife and children will be robust and healthy, so far as bone feed is necessary to health and vigor; fed on the ten bushels of poverty wheat, they will as certainly wilt, as the cow wilts fed on June grass; and as the calf wilts borne by that cow, and fed with her milk. As to grass, the question is, Can the farmer better afford to raise a half-ton per acre of June grass, or kindred poverty grasses; or even his two tons to the acre, on newly seeded grounds, if these two tons are deficient in elements the animal constitution demands? The feeding is the test. Fed on June grass, cows wilt bearing as well as feeding their young. The calves have a sickly appearance; though nature in her efforts to supply the lack of phosphates in the feed, will go to the extent of reducing the mother's bones to phosphatic elements, to feed her young, till her bones become honeycombed and without strength; and the mother so weak as to fall down, unable to rise. After all this painfully affecting effort of nature to transfer the life and health and happiness of the mother to the offspring, to supply the lack in her feed from which to elaborate proper nutriment for her young, still the sight of that calf reveals the fact that there is a lack in his feed; and there is as great a lack in that milk, for the farmer's children, as for his calves; while the newly seeded grasses, grown on soils exhausted of lime, will scarcely do more for his stock than to enable them to hold their own. Is the cow that simply holds her own, yielding her maximum

profit or her best quality of milk for her calves and the farmer's household? Can the farmer afford to raise any quality of grasses inferior to those we propose they should raise after their golden harvest of wheat?—rich, succulent grasses, charged with all the elements the animal constitution imperatively demands; grasses from which the cow can elaborate the proper nutriment for her young and have a surplus on which to thrive herself. When grasses will thus enable the cow to thrive and yield her daily store for the life of others, fed on the same grasses, the beauty of the God of nature will be upon the rest of his herd, in health and vigor and in growth and continued improvement; while the households are blessed who feed on the goodly products of the dairy and the flesh of these goodly animals.

The families and herds of New England have not suffered as yet, as they would have suffered, had not the flour and cracked wheat and graham and shorts and corn from unexhausted soils poured in upon them as a flood. But will this flood of life always flow? The same greed that has exhausted State after State will soon exhaust the rest. Then, if not in wisdom before, there must be earnest work in feeding the soil, in laying the hand upon everything that can be converted into plant-food. And soils exhausted by wheat and grasses must be fed with lime till milch cows no longer pine away and eat old bones.

When the bummers in farming have exhausted the last State, then the lack felt by animals on worn-out soils can no longer be supplied from abroad. The mighty nations that have been destroyed by some insignificant barbarous tribe, the historian tells you, had become effeminate on high living. Whereas, had he told you it was low living, living on the products of exhausted soils, it would have been nearer the truth. Their effeminacy was akin to what the cow feels fed on June grass. A land flowing with milk and honey is no rhetorical flourish, no poetic effusion, but fact. The two God joined together. The soil that yields the choicest feed for the dairy blossoms abundantly, yielding its sweets to the busy bee. The glory of the flowering field, the perfection of beauty in the families and flocks and herds; these things of beauty, above all others, Heaven designed should be a joy

forever. But where the soil-skinner is found, alas! they together soon pass away.

But, with the storehouse of Providence open to all, with its rich stores of clays and marl and muck and lime and plaster and marine exuvia, and its rich treasures from the animal and vegetable kingdoms, the high calling of the farmer is to restore this pristine beauty, this Canaan type of a goodly heritage, as a beauty and joy forever; a joy of health and long life; a joy of delight in fields of beauty surpassing Solomon in his glory, and in the robust beauty of the family and the herds; a joy of the rich harvest of milk and honey and the jubilant joy of harvest home, of his luxuriant fields of the choicest quality of *seed-wheat*.

Rye, so long as brown bread is held as a luxury, and the straw is held so valuable, will commend itself to the attention of the farmer.

Oats are one of the most exhilarating and muscle-developing of grains. They should be sowed early, and in no case should grass-seed be sown with them. Oats draw from the soil the same quality that grass feeds upon, and in most cases they will starve and smother the young grasses to death. Harvest the oats and immediately plough in the stubble and seed to grass. Lime or ashes, or even a coating of manure, well mixed with the soil, will not injure the crop of grass. The sample of hulless oats we cannot speak advisedly upon. We awarded a premium, the rather to call the attention of the farmers to it that they might test it for themselves.

Barley seems to have been known in the days of Gideon. One of the host of Midian and Amalek, encamped against Israel, dreamed that a loaf of barley bread tumbled into their camp and smote a tent that it fell. The dream was interpreted to mean the sword of Gideon, and that the Lord had delivered their host into his hands. Now we are at a loss to know why this interpretation of the dream, unless they had kept captive Israel on barley bread, and, knowing its virtues, they knew that the men who were rising under Gideon to regain their liberty, men who had been fed on barley-cake and could lap water as dogs, would endure well and fight well. If barley retains its virtue as an article of food, it is well worth while for farmers to raise it and give it a fair trial. Remember, it

is barley-cake and cold water that gives the Gideon vim, so frightening to the imagination of the host of Midian.

I think it was an oversight in the Committee that there was no premium awarded to the goodly specimens of grass-seed on exhibition. Facts demonstrate that there are seeds in the market that, from age or from some other causes, are worthless. I once had two acres to seed. I found at one store about seed enough for one acre. I took it and sowed it on one-half of the field. At noon I procured at another store enough to seed the other half. Both parcels were sowed the same day, on the same kind of soil, equally well prepared. Result, one-half well stocked; the other—I had no evidence that a seed sprouted. Now this worthless seed was what was left of a lot that had been sold to the farmers. What a severe loss to those farmers. Now, supposing I had gone direct to the other store and procured the rest, and had mixed the two parcels together, and then sowed. The result would have been expressed in the very language of hundreds of farmers every year: "I sowed a liberal quantity of seed, but somehow my ground is not more than half seeded." Suppose, again, that I had found enough to seed the two acres at the first store. I should have expressed the result in the very language of perhaps threescore farmers that had bought of that lot of seed: "I never sowed a larger quantity of seed to the acre; but the dry weather came on, and I don't know that there is a seed come; I shall have to plough it again; I am sorry; I had taken great pains to enrich and prepare the ground for grass; it frustrates all my plans for a hay-crop for another year." In our opinion there never was, and never will be, a worthless pound of seed lost till it comes into the hands of the farmer, entailing its hundred-fold loss to him. Remedy: every farmer raise his own seed; harvest and preserve with care.

For the committee,

D. Todd, *Chairman.*

ROOT CROPS.

ESSEX.

Statement of S. A. Merrill.

Carrots.—I enter for premium one-half acre of carrots. The land on which they were grown was an old, worn-out pasture three years ago. It was ploughed and planted one year ago with potatoes, with green barn-manure spread broadcast and cultivated in drills, using 300 pounds of guano to the acre. Last year it was planted with carrots, using about six cords of waste manure to the acre. This year I ploughed and planted about the middle of June, using six cords of manure to the acre. I think this time the best for planting carrots, for two reasons. In the first place, we save one weeding; second, I think carrots, that are not too ripe, keep much better in winter, and they grow better in the autumn than they do in the hot weather. I raised from this half-acre, twelve tons of good marketable carrots, of the long orange variety, worth more for marketing in the spring than the medium or shorthorn carrot, at least this has been my experience for several years. The cost of this crop is as follows:—

Ploughing,	$1 50
Harrowing and cultivating,	1 50
Value of manure,	25 00
Applying manure,	5 00
Seed,	50
Hoeing and weeding,	8 00
Harvesting,	7 00
Land rent,	10 00
Total,	$58 50
Value of crop, 12 tons,	$120 00

Statement of J. J. H. Gregory.

Onions.—The lot of onions offered for premium are of the early red globe variety, and were grown on a piece of reclaimed meadow-land. This land, after having been suitably drained, was covered with sand and gravelly loam at the rate of about a hundred two-horse loads per acre. The land on which the onions grew had onions also the year previous, and the year before that we cultivated it to cabbages and potatoes. The manure used this season was mostly a compost of well-rotted glue-manure and muck, which had absorbed the drainings from a manure pile of the same material located on a slope above. It was applied at a rate of about nine cords to the acre. The land was brushed and planted in rows fourteen inches apart at the rate of four pounds of seed to the acre, great care being taken to get the seed at a uniform depth. Throughout the season the ground was kept clear of weeds, receiving, in short, first-rate care. The crop ripened down very early. The piece selected contained exactly half an acre, and the crop weighed 18,484 pounds, which, at the legal weight of fifty-two pounds to the bushel, would make 355 bushels. The following statement shows the cost of the crop :—

Manure and spreading on half an acre,	$45 00
Ploughing half an acre,	2 50
Harrowing, raking, and planting,	6 00
Seed,	10 00
Three slidings,	4 00
Three weedings,	12 00
Pulling and turning,	5 50
Harvesting,	8 00
Topping,	9 50
Use of land,	6 00
Total,	$108 50

Onions raised on reclaimed meadow cost less per acre than on upland, the difference being felt mostly in the preparing of the ground and the weeding. As I use a large proportion of each of the crops entered by me; viz., onions, squashes, and beets, as seed stock, I make no estimate of market value.

Statement of Ira F. Burnham.

Onions.—The land on which my onions grew, as measured by your committee, contains one-half acre. In the spring of 1874 it was dressed with three cords of barn-manure, and planted with a variety of vegetables for family use. Last spring I ploughed in four cords of barn-yard manure, harrowed it till fine, and sowed, on the 26th of April, two pounds of Danvers onion-seed, in rows fourteen inches apart. The seed came up very evenly. In June I sowed on two barrels of the Brighton blood fertilizer, which had a very marked effect, the young plants growing very rapidly. The following is the cost of the crop :—

Ploughing and preparing land,	$4 00
Seed,	10 00
Manure, 4 cords,	28 00
Weeding 3 times,	24 00
Two barrels Brighton fertilizer,	10 00
Harvesting,	10 00
	$86 00
By 330 bushels of nice, well-ripened onions, at 75 cents per bushel,	$247 50

Statement of J. J. H. Gregory.

Beets.—The soil on which these grew is a strong loam manured with an admixture of sea, barn, and glue manure at the rate of five cords to the acre. This was thoroughly mixed with the soil, and after harrowing and raking, the seed was planted at intervals between the 18th of June and the 3d of July, in rows sixteen inches apart. In the plot were four varieties of the turnip beet; viz., early blood, Simon's early, Dewing, and Egyptian. The beets were thinned to six inches apart in the rows, had clean cultivation, and were pulled and topped from October 15 to October 25 when of an average diameter of about three and one-half inches, a good size for table use. The area of the plot was 22.346 feet, and the number of pounds of the yield was 19,754, a little short of ten tons, which, at sixty pounds to the bushel, would make

329 bushels. As will be seen, the crop is not presented as a crop for fodder purposes, for in that case they would have been planted as early as frost left the ground, and have been thinned to a distance of eight or ten inches apart in the rows. By planting them very early on a rich soil, I have grown the early blood turnip beet to weigh from ten to twenty pounds and reach the size of a half-bushel measure. This crop is presented as an excellent yield for beets of a size suitable for table use. The following shows the cost:—

Manure and spreading,	$25 00
Ploughing, harrowing, and raking,	8 50
Seed and planting,	3 00
Three slidings,	4 00
Three weedings,	14 00
Pulling and topping,	10 00
Harvesting,	2 50
Use of land,	3 00
Total,	$70 00

DEERFIELD VALLEY.

Statement of E. L. Mason.

Potatoes.—The piece of potatoes which I enter for premium consisted of three acres of meadow-land. The crop grown upon it in the years 1873–4 was hay. One-half of it was ploughed in the fall of 1874, the remainder in the spring of 1875. That ploughed in the fall was manured in the spring and the manure harrowed in. On the remainder the manure was spread broadcast and ploughed under about eight inches in depth. The soil was heavy loam. I experimented with Bradley's phosphate, lime-ashes and wood-ashes, using these separately and in the hill, and on another part used no fertilizer in the hill. I planted my potatoes on the 25th of May, and furrowed for the rows 2½ feet apart, distance of hills fifteen inches; cut my potatoes (which were Early Rose) in pieces, using two and three eyes to the hill. I would state that where I used phosphate the yield was best, lime-ashes next. The potatoes were better upon the land that was ploughed in the spring, than upon that ploughed in the fall.

Cost of Crop.

20 cords of manure,	$90 00
One-half removed by crop,	45 00
Cost of ploughing and preparing land,	10 00
" seed and planting,	20 00
" cultivating,	10 00

The yield was at the rate of 472 bushels to the acre.

PLYMOUTH.

Statement of James Howard.

Beets.—The land on which my beets grew measures 50 square rods, and is a low, stiff, gravelly loam; it was in corn in 1873, manured with stable-manure, at the rate of four cords to the acre, with a small quantity of bone and ashes in the hills; in potatoes in 1874, manured nearly the same as in the previous year; ploughed once in April, 1875, six inches deep, smoothed down with cultivator and rakes, and one pound of long red mangold seed sowed with a machine; cultivated twice with a horse, and hoed three times; harvested the last of October. Product: 23,160 pounds, or 386 bushels of beets, being at the rate of $1{,}235\frac{12}{60}$ bushels per acre, and tops worth, perhaps, $3, which is much less than they would have been worth but for the early frost, which injured them as food for stock (for which I think them quite valuable when uninjured), and also checked the growth of the roots prematurely. Weeds have grown with unusual rapidity the past season, and the cost of cultivation has been thereby increased. I think beets should be planted as early as the season and the condition of the land will permit. The manure applied this year consisted of $1\frac{5}{8}$ cords of barn-manure, 166 pounds of low-grade German potash, 140 pounds of Davis's phosphate and six bushels of hen-manure.

Cost of Crop.

Ploughing, etc.,	$2 00
Manure,	20 75
Seed and planting,	1 75
Cultivation,	12 00
Harvesting,	7 50
Total,	$44 00

Statement of Lewis Leonard.

TURNIPS.—My turnips grew on forty square rods of dark loam, somewhat sandy, which was in grass in 1873, top-dressed lightly with compost, at the rate of about three cords to the acre; in grass without manure in 1874; ploughed once six inches deep in the spring of 1875, turning under three cords of coarse manure; harrowed four times and raked down smooth; planted between the 25th and 28th of June, with a machine, in rows about two feet apart, using nearly a half a pound of the yellow Swedish turnip seed, many of which were wasted through a derangement of the machine; thinned to about a foot apart in the rows, and hoed four times. Product: 199¼ bushels of turnips, or at the rate of 798 bushels per acre, and a large quantity of tops, which, I think, are of considerable value as food for stock, especially for milch cows, if fed immediately after milking.

Expense of Crop.

Ploughing, etc,	$4 00
Manure,	24 00
Seed and sowing,	1 50
Cultivation,	6 00
Harvesting,	8 00
Total,	$43 50

Statement of Spencer Leonard.

SWEDISH TURNIPS.—The land on which my turnips grew, containing forty square rods of sandy loam, was mowed in 1873, and also in 1874, in June, after which it was ploughed, manured with 150 pounds of the Brighton fertilizer, and sowed with Hungarian grass, from which a good crop was obtained. This year it was ploughed the last of May, harrowed and bushed; and, just before sowing, was well bushed a second time, thus killing a large proportion of the weeds and much lessening the cost of weeding and subsequent cultivation. Planted, June 25, with a seed-sower, in drills about thirty-four inches apart, using one-fourth of a pound of seed of the yellow Swedish turnip. The seed came up very

irregularly, but finally in sufficient numbers to insure a fair crop; cultivated three times, and hoed twice with hand-hoes; harvested from November 1st to 5th. Product: 8,520 pounds, or 142 bushels of turnips, being at the rate of 568 bushels per acre, and five tons of tops, by estimation.

Expense of Crop.

Ploughing,	$1 50
Manure,	15 00
Seed and sowing,	50
Cultivation,	5 00
Harvesting,	5 50
Total,	$27 50

ESSEX.

From the Report of the Committee.

Sugar-Beet.—What is a sugar-beet? By the agricultural public, and even by the agricultural papers which profess to be teachers of the public, the term sugar-beet is almost always misapplied. One of our agricultural papers recently, in a long editorial, written with the avowed object of making clear to the uninstructed mind the difference between a beet and a mangold-wurzel, asserted that the sugar-beet grew to the length of about fifteen inches! The term sugar-beet is an unfortunate one, as the word sugar had already been appropriated to express the sweet flavor of the varieties of beets raised for table-use, while the word beet is strictly a misnomer, the vegetable sugar-beet being in reality a mangold-wurzel. A generation ago our fathers used the term sugar as a familiar designation for any sweet variety of beet raised for table-use, and at the present time by the great majority of the public the term is still so used. As the new industry of manufacturing sugar from the beet grew on the continent of Europe, seedsmen were called upon to supply for commerce seed of the best variety for this purpose. It was necessary that this variety should be as free as possible from all coloring substance, as all this would as a matter of course give a stain to the juice, and impose on the manufacturer the

labor of purifying it. The one at first selected was the long, white mangold-wurzel, and this was called the sugar-beet in commercial parlance. This white mangold was not entirely white, the portion of it that grew above-ground being usually colored a light green by exposure to the sun's rays. It became, therefore, an object for the manufacturer to still improve on this mangold, to the end that all the coloring matter in the root should be eliminated. The intelligence and enterprise of the seedsmen of Europe responded to this want, and in the course of a few years two prominent varieties of mangold were produced that have nearly completely satisfied it—one of these were sent out by the estimable house of Vilmorin, Andrews & Co., of Paris, and is named "Vilmorin's new Improved White"; and the other, "White Imperial Extra," by the distinguished German house of Ernest Benary.

These improved sugar-beets of commerce grow nearly entirely under-ground. They are called beets, but are so only in a generic sense, just as the green-fleshed melons are included in the word muskmelon when that word is used in a generic sense, though at the same time we know that by the muskmelon in the familiar language of the family we mean only the mealy, yellow-fleshed variety. When grown, these beets define themselves to be the mangold variety by the coarser structure of the root, the stouter ribs of the leaves and the greater coarseness of the leaves, which spring in larger masses directly from the crown than is the case with the beets for the table.

The moral of all this for you, my farmer friend, is, that if you want a beet for table-use, do not order seed of the sugar-beet, or you will be very likely to find a mangold growing in your garden, a return, but not a recompense, for the sweat and toil of the husbandman.

J. J. H. Gregory, *Chairman.*

MANURES.

ESSEX.

From a Report by J. J. H. Gregory.

There is an idea, very generally prevalent in the community, that, though other substitutes may do for an emergency, yet to keep up the fertility of the farm through a long series of years, barn-yard manure, by which is specially meant that of horses and neat-stock, is, after all, the only reliance. I believe that this idea can be shown to belong to the popular class of errors, though countenanced very generally by the agricultural press, and by the agricultural writers of the popular type. To demonstrate that the agriculture of the farmers of an entire community is carried on, and that most successfully, too, with but little dependence on the manure of the barn-yard as a fertilizer, I will instance the practice of the farmers of Marblehead, extending over a period of more than twenty years. Their crops are mostly early potatoes, cabbages, squashes and onions, vegetables which require the very highest feeding to give first-class crops; and these enterprising tillers of the soil are well known to fame as a class who are contented with nothing less than first-class crops, and when they fail in growing these the cases are exceptional. As a body, beyond one, or perhaps two cows for family use, they keep almost no stock in addition to that needed to carry on the work of the farm. These consist of from two to four horses, or in the place of two of the horses, a yoke of oxen. From such resources it will be seen that there can average but about half a dozen cords of home-made barn-manure annually. Of barn-yard manure from other sources, some of them on an average purchase three or four cords a year, while half of them do not purchase any at all.

Now these farmers will average as many as five acres each in vegetable crops, and their average application of manure is certainly as high as from eight to ten cords to the acre.

It will be seen, then, that while the average use of barn-yard manure is less than ten cords each by the farmers of Marblehead, the average quantity of manure used by them is forty cords or more. We find here, then, a community which, in refutation of the old axiom, that barn-yard manure lies at the basis of successful agriculture, have for twenty years kept their soil in the highest state of fertility with but little dependence upon it, while they are known by their crops far and wide as successful farmers. How they have accomplished this, what plant-food they use as a substitute, and how they prepare it for the soil, does not come within the sphere of my article, and I will therefore pass on to give a single illustration from my own experience of how a large crop of cabbages were successfully raised without any help from barn-manure.

In the spring of 1874, I broke up in an old pasture, wherever I could find sufficient depth of soil among the ledges, about three acres of rough hilltop and sides. As the road up the hill was very steep, making the teaming of common compost a very difficult matter, while six hundred cords on various fields of tillage had about exhausted all resources in that direction, I was more than half compelled to use concentrated fertilizers as a substitute. I chose hen-manure, ground bone, and German potash salts. The hen-manure was collected in town at a dollar a barrel, the bone was a part of about thirty tons of bones that had laid together until about rotten, and were then ground in a bark mill. These I purchased at from $20 to $25 per ton. They had been offered in neighboring towns in large or small lots, and yet there were found but two purchasers sufficiently intelligent or enterprising to invest in them at this low figure! Dr. Loring was one of these; the name of the other gentleman I have forgotten. The condition of the bones was so coarse, that probably the word crushed would best define it. The potash salts used were of the cheapest variety, known by the name of kainite, which contained but a minimum of potash to a maximum of chloride of sodium, or common salt; a subsequent analysis proving that the composition as given was

incorrect, the proportion of potash present being not nearly so great as the original analysis set forth. Thanks to our Agricultural College, this deception was duly detected and duly exposed, so that the public is not so likely again to pay for a good article and get a poor one. In these three articles were the three substances which make up about all that vegetation needs; viz., nitrogen, phosphate of lime and potash. The hen-manure and bone were each rich in nitrogen and phosphates, while the kainite gave the potash. The hen-manure was especially rich in nitrogen and the bone in phosphates. To manure the three acres I used twenty-five barrels of hen-manure, twelve barrels of bone and three of kainite. These were composted with about an equal quantity of fine loam—a square heap being made by spreading layer on layer of each to a height of about three feet. The mass was allowed to remain for three days, until well heated by fermentation, when it was pitched over and very thoroughly mixed together and allowed to stand about twenty-four hours longer, when heat having again been developed, it was again pitched over, and the process was a third time repeated. The entire mass had now become very thoroughly mixed together, and was mechanically in very fine condition. The ground having been thoroughly prepared, about a quart of this compost was applied to each hill, covered with soil, and the seed planted upon it. The result showed that the kainite was too strong of common salt, for but few of the seed vegetated. The trouble could not have arisen from the hen-manure being too concentrated, for I have often used it as strong, and even stronger, and yet had no difficulty in getting healthy plants. The result was, we were compelled to transplant into many vacant hills. The crop received the usual cultivation, and, though a part of the growing season was very dry, and this crop was on a high, steep hill, yet ultimately I had one of the finest crops of Essex, Wakefield, Winegstadt, Wyman and Schweinfurt Quintal cabbages it was ever my fortune to raise; indeed of the Schweinfurt, I think of the many years I have raised them, I never had so fine a crop.

The cost of the manure was as follows:—

Twenty-five barrels of hen-manure, at $1 per barrel, . .	$25 00
Twelve barrels of bone, 180 pounds each, at $22.50 per ton,	24 30
Kainite, about	12 00
Expense of composting, ...	5 00
Cost of teaming manure, ...	5 00
Total, ...	$71 30

It will be seen that the cost of the manure on the ground, and mixed, was about $24 for each acre of cabbage. Any farmer of experience knows that, as a rule, to insure a first-rate crop of each of these varieties of cabbage, at least six cords of good stable-manure to the acre would be required; and as every farmer of experience also knows, such manure, landed in the field, costs on the average $10 to the cord, which would make the cost for each acre of cabbages, $60, on the side of barn-manure, and for the three acres, $180, against $71.30 on the side of the mixture.

But the common farmer may say that the six cords will leave residue in the ground which the grass-crop will find when the land is laid down. True; but so will the mixture leave considerable of phosphate of lime, potash and salt behind it. But raising cabbages on such a scale belongs to market-farming rather than to common farming, and those who follow it only at long intervals, lay land down (grass is the poorest return they get), and meanwhile for many years every acre receives just about as much manure one year as another, but little or no account being taken of what might be left in the soil by the preceding crop.

DAIRY STOCK.

ESSEX.

From the Report of the Committee.

We suppose there is a twofold object in offering this premium. First, to induce owners of good herds to exhibit their stock, and thus add to the interest of our annual show; and, second, to elicit, by the required statements, reliable information respecting the manner and cost of keeping, and the income obtained. We think the latter a matter of very great importance. There has been much written of late regarding the profit of this branch of farming, and this question is frequently discussed among farmers. It is pretty generally conceded by practical farmers in this region, that the margin of profit in the dairy is small, although a person is occasionally found who thinks the production of milk for the market a money-making business. We do not propose to discuss this question, but would call attention to the need of more definite and exact information respecting this branch of farming. Very few persons really *know* how much value their cows produce in a year, or how much value in food and labor is expended on them.

The dairy forms one part of the farm operations, and they may, perhaps, be able to tell at the end of the year whether, on the whole, they have gained anything from the farm; but they cannot tell whether or not it would have paid better to have sold the produce consumed by the cows and bought a quantity of manure equal in value to that produced by the cows. Every farmer who keeps a herd of cows, or who thinks of doing it, would like to know how much money return he can reasonably expect to receive from such a herd of cows as is practicable for him to obtain. If our milk producers, who

make this one of the means of living, would take the trouble to keep an exact account for a year or two of the yield of their herds, the amount received for dairy products and the manner and cost of keeping, it would be of the greatest value to many young farmers, and not a little benefit to themselves. The vast difference in the income of different cows, without any perceptible difference in cost of keeping, would surprise us, and the result of careful observation would very likely show that, in a herd of twenty cows, a large portion do not pay expenses, while the remainder yield a good profit.

It may be objected, that keeping an exact account of the production of each individual in a large herd, would involve such an amount of labor as to be practically impossible. But we think not. Let the milk of each cow be measured or weighed one day in each week for a year, and the amount produced by each one in that time could be very easily calculated. The knowledge gained by trying this experiment is worth, to the person trying it, all the trouble it costs.

It would, doubtless, be found that a large proportion of cows do not pay expenses. But is not the first step to pecuniary success in dairy farming to ascertain how much a cow must yield to pay a fair profit, and the next to find out which individuals of the stock are not doing it.

We want information, too, respecting the income farmers of good judgment in the selection of stock actually do receive from such cattle as they can obtain, for it is utterly impracticable for a milk producer to buy a herd of cows which will all prove to be extra. And then the farmer, in deciding whether or not it is profitable for him to continue in this branch of his business, must extend his observations over a term of years. He must buy his cows and sell them before he can tell exactly how the account stands. If he buys extra stock for milk, he must pay for that quality in the cow, and when her usefulness is ended, he must expect to sell her for the sum she is worth for beef. If he has a large stock, he must expect to lose an animal occasionally, and must constantly expect more or less loss from swelled udder, or "garget," and he must bear in mind that a large milker is more liable to diseases of this nature than a cow yielding a moderate quantity.

Another point on which more definite knowledge is wanted, is the feeding. Milk producers are not agreed as to the food best calculated for making milk. It is agreed that something must be fed besides hay, but whether shorts, fine feed, cotton-seed, oil-cake, corn-meal or roots, is by no means settled. The comparative value of these different kinds of food for the production of milk, is a matter on which few farmers have a well-grounded opinion. It is claimed on good authority that cows can be kept much more economically, with equally good results, by giving "chopped feed," instead of feeding the same kinds of provender dry. We know farmers practising this mode of feeding, who think one-fourth of the hay can be saved in this way, and the cows kept equally well. If this is true, it is a fact well worth knowing and practising. On all these points farmers need more definite and precise knowledge, which can only be obtained by careful experiment. The sum of it all is, that in this, as in all other operations of the farmer, it may not be very easy to ascertain exact financial results. But such a knowledge is essential to success, especially in a business where the margin of profit cannot be large.

Jos. S. Howe, *Chairman.*

Statement of George B. Dodge.

I enter for premium for best milch cow, my grade Ayrshire cow, "Star," calved March, 1867. She dropped her last calf February 6, 1875, and is due to calve again December 31, 1875. Her feed, until turned to pasture, was the best of English hay and rowen, with two quarts of Indian meal and about a peck of roots per day; since the 20th of May, good pasturage. Commenced August 1 feeding one armful of corn-fodder in the evening, and one quart of Indian meal in the morning. Commenced March 1 weighing her milk, and weighed it until September 1; her average during March was 38.8 pounds; for April, 40.2 pounds; for May, 38.2 pounds; for July, 34.1 pounds. Her record for the months of June and August, as required by the rules of the society, is as follows:—

June 1 to 10, inclusive.

Morning,	180	pounds.
Evening,	222½	"
Total,	402½	"
Average weight in pounds,	40.25	"

August 22 to 31, inclusive.

Morning,	142	pounds.
Evening,	157½	"
Total	299½	"
Average weight in pounds,	29.95	"

Statement of Benjamin P. Ware.

I offer for premium my thorough-bred Ayrshire cow, "Rose 2d," born March 5, 1870, whose dam was "Rose," grandam "Marjary," imported by Joseph S. Cabot. "Marjary" was bred by John Kilgore, of Notmine, Scotland, great-grandam "Lillias," bred by Mr. Kilgore, great-great-grandam was bred by Captain Martin. "Marjary's" sire was "Jamie," bred by Alex. Arnold, of Aucheneunie; the sire of "Rose 2d" was bred by E. S. Poor, from a bull imported by him. "Rose 2d" dropped her calf June 2, therefore could not account for her milk the first ten days of June. The weight of her milk for the last ten days of August was three hundred and ninety-nine pounds.

Allowing 2.15 pounds as the standard weight of one quart of milk, the yield would equal 185.12 quarts, averaging 18.5 quarts per day. Her feed has been as much green corn-fodder as she would eat in the forenoon, and turned out to pasture and water in the afternoon, with two quarts of shorts and one quart of meal morning and evening. Her milk, by the lactometer, shows eleven and one-half per cent. cream.

Statement of George W. Russell.

I enter my Jersey cow, "Nellie Blen, 2d," 1148, A. H. B., calved August 17, 1870, making her five years of age, and bred by me, for the premium of the best milch cow of any breed, with satisfactory evidence as to her milk, manner of

feeding, etc. "Nellie Blen 2d" dropped heifer-calf December 22, 1874. January 1, 1875, I commenced to measure her milk, and have measured it daily up to September 1, 1875. During the winter she was fed on good hay, with one quart corn-meal and one quart cotton-seed meal twice a day until the 20th of May, after which she had nothing but pasture feed until August 1, 1875; since then, two quarts meal daily. Due to calve November 6, 1875.

Record of her Milk.

Gave in	January,	627	quarts	= 20¼	quarts per day	=	1,348¼	pounds.
"	February	532	"	19	"	"	1,143⅘	"
"	March,	558	"	18	"	"	1,199 7/10	"
"	April,	480	"	16	"	"	1,032	"
"	May,	465	"	15	"	"	999¾	"
"	June,	450	"	15	"	"	967½	"
"	July,	379¾	"	12¼	"	"	817	"
"	August,	274	"	9	"	"	589 1/10	"
		3,765¾	"				80,873	"

The above record shows a yield of 15.50 quarts daily for eight months.

DAIRY PRODUCTS.

HAMPSHIRE, FRANKLIN AND HAMPDEN.

From the Report of the Committee.

BUTTER.—All concede that, to make first-class goods in the varied departments of manufacturing, the raw material must be good, the machinery or appliances adequate, with skilled labor, and, in addition, a remunerative market.

First. The dairyman knows that different breeds of milch cows differ in the producing properties for butter; and cows of the same breed, likewise, differ in the quality of their milk. Hence, in buying a cow exclusively for a butter dairy, the milk should be examined by means of a microscope, or some other reliable test. Again, the cream rises quicker on the milk of some breeds of cows than on others. We should not

buy milk from a Dutch herd for butter, in preference to Jerseys. To have the highest success, the stalls of the butter herdsman should not contain mixed breeds of cattle. As the cow is only a "vitalized manufactory" to change the elements of grasses, grains and roots into milk, so her feed should be abundant and nutritious. To gain this end, the pastures should be improved. It is desirable that pastures should have a variety of fine, sweet grasses, of succulent properties, with a succession of growth; that noxious weeds, sedge-grasses, bushes and brambles be eradicated. It is capital well invested to fertilize pastures, particularly with the wood-ash and gypsum. The water, too, should be pure, abundant, and not in stagnant pools. The grass for winter-feed of the milch cow should be cut early, before or as soon as the seed is soft and pulpy, nor should it be over sun-dried. During the dry months of summer, some forage-crops for soiling ought to be cultivated to maintain the flow of milk. In winter-feeding, roots and grain should be given, with hay. As the quality of the milk is affected by the feed of the cow, we prefer, for roots, the carrot, parsnip, or sugar-beet. Supplying milch cows with water in winter demands no small attention from the herdsman. The patient cow, that contributes so much to the necessities as well as the luxuries of living, should be treated tenderly. In driving or milking, gentleness, kindness and quiet are preferable to blows, milking-stools, boots or stones. Talking, especially when loud, ought not to be allowed while milking. A little hay before the cow, when being milked, tends to quietude. Not the least consideration to prevent "barny taste" in cream and butter, is cleanliness.

Second. The milk-room should have a northerly aspect, removed from the odors of filthy yards or pigsties, nor be over a damp or vegetable cellar. Registers should be so arranged in the walls as to admit pure, dry air when wanted; also the exit of impure air. Charcoal, in boxes, in different parts of the creamery, is a good disinfectant. A subdued light is preferable. Heat can be introduced through steam-pipes attached to the kitchen-range stove. The temperature of the room should be about 60 degrees, Fahrenheit. All milk and butter appliances should be washed thoroughly, scalded with

water that will "dance, as well as sing." No department in the farm-house requires the "carking care" and scrupulous cleanliness of butter-making. The milk-vat, or stationary pan, to say the least, is labor-saving, not naming other excellences. The cream ought to be removed as soon as the milk becomes *slightly* sour. (Cream is deteriorated when the pan of milk is loppered.) Sweeter butter is made from milk that has set but twelve hours, than that at twenty-four. Cream, while collecting, should be stirred in the pail when additions are made, and the pail slightly covered. Churning should be done frequently; the stroke of the floats should be slow and uniform. The temperature of the cream, when put in the churn, should be from 60 to 62 degrees. Ice and water ought to be used sparingly about butter, and the buttermilk well extracted. About three-fourths of an ounce of salt, to one pound of butter, is requisite to give it a relish, leaving the peculiar fragrant smell that marks "gilt-edged" butter. In this stage of butter-making, judgment is necessary not to overwork it, so as to destroy the firmness or grain. When cooled, remove the brine, and mould it to suit the market.

Third. Butter-rolls designed for a city market, or country store, ought to be wrapped in strips of thin cotton cloth, packed into a convenient sized tin box, and this inclosed in a larger wooden box, ample or ice. Butter, how well soever manufactured at the farm-house, may become inferior in quality by improper packing and careless transportation; but more frequently by being put into the merchant's tub or refrigerator not overclean, or by contact with poorer qualities of butter. Too frequently the butter-tub is left open in the proximity of codfish, tobacco, kerosene, and various odors of the back store. Many consumers, as well as merchants, are not aware how soon uncovered butter becomes air-slacked, or how rapidly it absorbs surrounding odors.

When the consumer is more willing to pay for butter according to its quality—as he does for different qualities of cloth—then there would be an incentive to furnish a better article, and the painstaking, skilled butter-maker would receive her full reward.

Mrs. H. C. Haskell, *for the Committee.*

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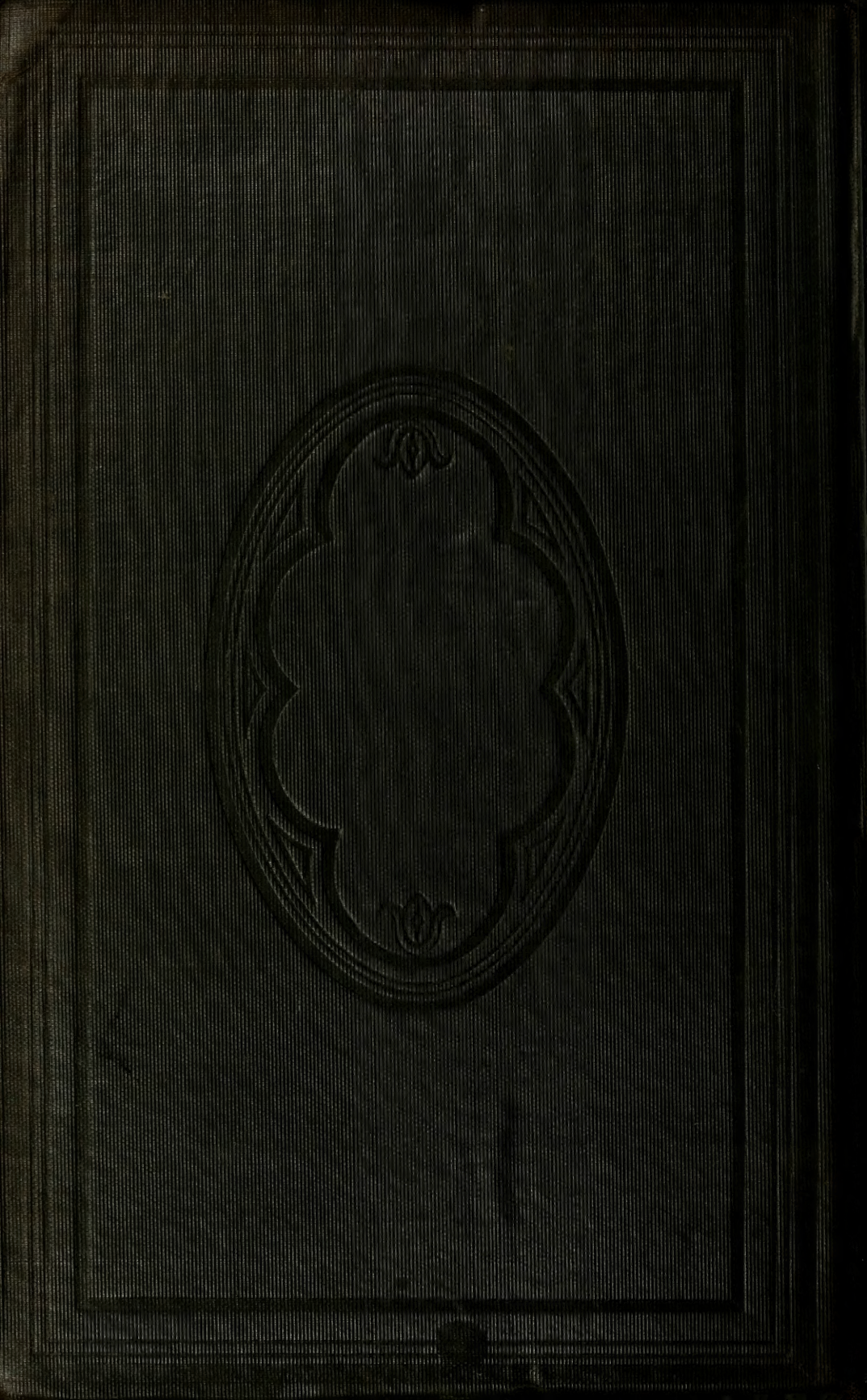
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